AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

CIVILIAN AND DEFENSE

In This Issue . . . Materials Handling Problems · · · · Great Fuel Savings Possible · · · · Windless Wind Tunnel · · · Nash's Half Century · · · Honeycomb Panels for Trailers · · · · Multi-Fuel Tractor Engine

AUGUST 1, 1952

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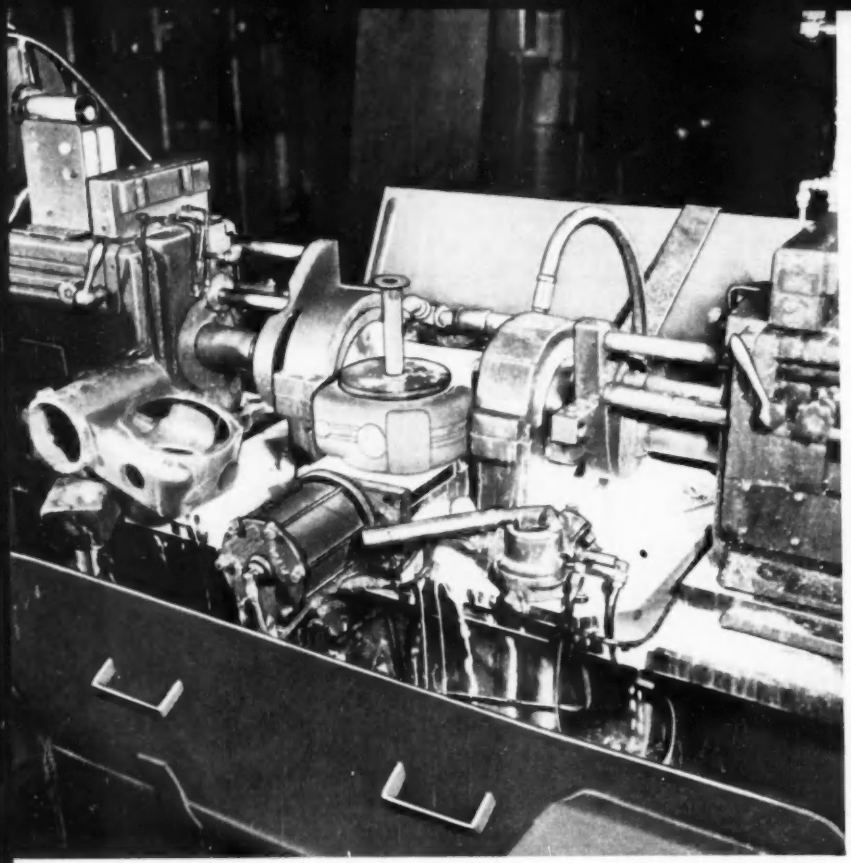
A CHILTON PUBLICATION



Solution for a hard water problem

• "With the hard water we have at this plant, SUPERLA Soluble Oil works best of all products tried," reports Carl J. Winkler, president of U. S. Machine Corporation, Lebanon, Indiana. The company, manufacturing Winkler heating equipment, has used SUPERLA for 15 years. During this period, other coolants have been tried, but none has given the results obtained with SUPERLA Soluble Oil.

Boring of the cast iron main housing for a Winkler oil burner is illustrated above. With SUPERLA Soluble Oil, the life of carbide tools has proved excellent. There has been no spoilage of the work due to rusting. Moreover, clean operation and freedom from odor development with SUPERLA have provided desirable working conditions for machine operators.

SUPERLA
REG. U. S. PAT. OFF.
Soluble Oil

To help select the right coolant or cutting oil for your own machine tool operations, call for the services of a Standard Oil lubrication specialist. Contact your nearby Standard Oil Company office.

What's your problem?

Meet Wesley L. Tharp, lubrication specialist with headquarters at Standard Oil's Indianapolis office. U. S. Machine Corporation is one of the manufacturing companies he contacts regularly in order to help keep production running smoothly.

Like all Standard Oil lubrication specialists, Wesley Tharp has a good background of practical experience plus thorough training in Standard's own schools. And like all specialists, his on-the-job assistance is always available to the industries in the immediate area he serves. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest.

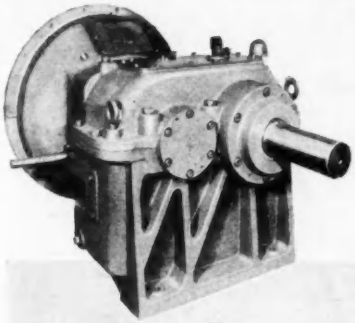
Put a Standard Oil lubrication specialist to work on your problem today! When he calls, ask him about such outstanding products as:

STANICUT Cutting Oils. These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades vary in viscosity and compounding. Each contains the correct proportion of extreme-pressure and friction-reducing ingredients.

STANOSTAMP Compounds. Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*

...Cotta Reduction Gear, original equipment on Model 2400 Lima Shovel



Modern, high-speed engines have presented problems to many users and manufacturers of heavy-duty equipment. Cotta has the answer! For cranes, drillers, locomotives, shovels, generators, pumps, etc., Cotta Reduction Units are designed to modify output speed of new engines to meet requirements of such equipment. In these days, particularly, when new equipment will be hard to get . . . when old equipment must be rebuilt . . . when new designs are delayed due to demands of the defense effort . . . "Come to Cotta" for speed reduction and power transmission units. Reduction Gears are available in a broad range of ratios, with input torque from 150 to 2,000 foot pounds.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

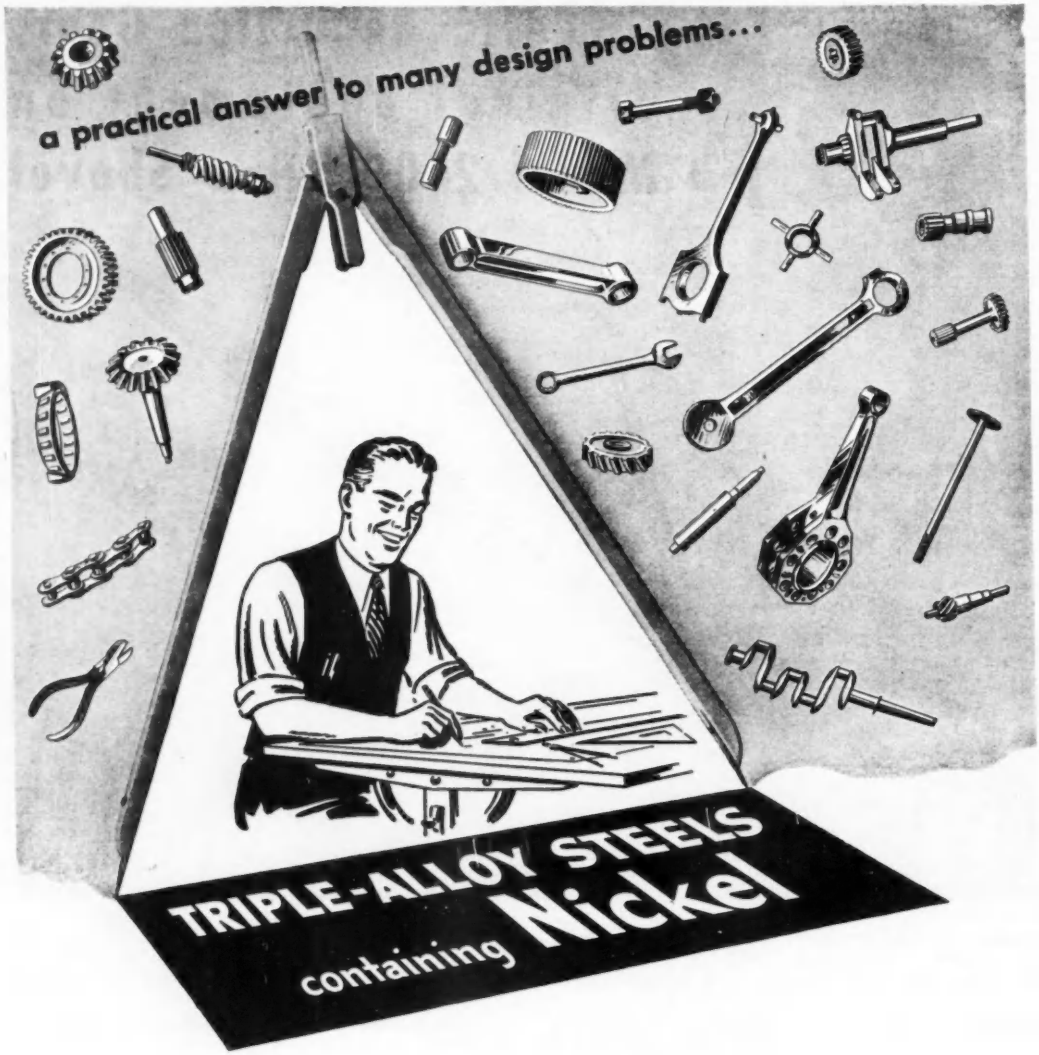
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA

HEAVY-DUTY REDUCTION UNITS

"Engineered-to-order"



Triple-alloy steels containing nickel offer designers the following *triple* advantages:

1. OUTSTANDING PERFORMANCE—Strength and toughness, resistance to wear, fatigue or shock to meet a wide range of requirements, as dictated by design.
2. RELIABILITY—based on consistently uniform response to heat treatment.
3. ECONOMY—resulting from standard compositions precisely graded to match the engineers' needs.

Service records established by triple-alloy steels over a period of years show that they are giving excellent results in many diverse and exacting applications.

The many standard combinations available permit accurate and economic selection for specific uses.

Because of their many advantages, these triple-alloy steels warrant your careful consideration when planning new or improved designs. We shall be glad to furnish counsel and data upon request.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

AUTOMOTIVE INDUSTRIES

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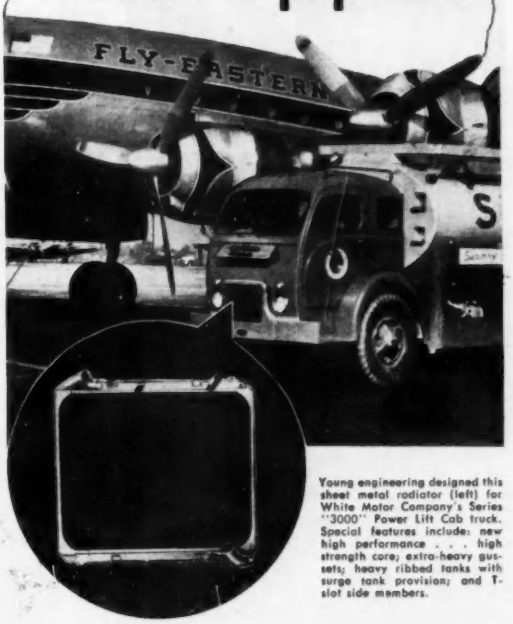
modern cooling for modern equipment



Young engineering designed this sheet metal radiator (left) for White Motor Company's Series "3000" Power Lift Cab truck. Special features include: new high performance . . . high strength core; extra-heavy gussets; heavy ribbed tanks with surge tank provision; and T-slot side members.

For twenty-five years Young has been engineering and building automotive heat transfer products. Many of the nation's leading manufacturers of trucks, buses, Diesel locomotives and stationary engines, compressors, road building and agricultural machinery—equipment that requires rugged radiators and special attention to capacity—assign Young Engineers to develop the cooling system.

Whatever the capacity required, Young has either a standard unit—or the ability to design one—capable of delivering the most heat transfer per pound of product. May we assist you in your requirements?

ATTENTION AIRCRAFT DESIGNERS!

Check with Young's Engineering Staff for the latest in Heat Transfer: Air to air; gas to air; oil to air; water to air; and oil to fuel.

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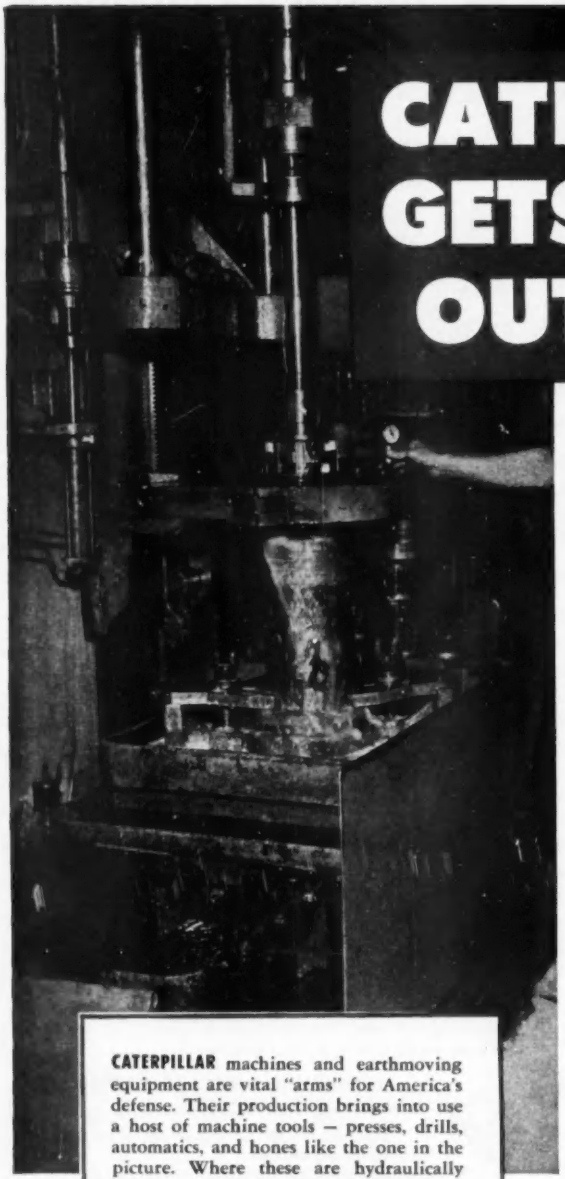


CATERPILLAR GETS ORDERS OUT FASTER

...with the help of TEXACO REGAL OIL (R&O) in hydraulic mechanisms

To maintain production and meet delivery dates, machines at Caterpillar Tractor Co.'s plants *must keep working*. Unscheduled stoppages of hydraulic mechanisms, for example, simply cannot be tolerated. So quality comes first in choosing a hydraulic medium. *Texaco Regal Oil (R&O)* has proved ideal.

For Caterpillar, as for other quality-wise manufacturers, *Texaco Regal Oil (R&O)* assures: 1) clean hydraulic systems; 2) smooth, uninterrupted operation; 3) protection of internal parts against rust; 4) longer operating periods between drains and overhauls; and 5) lower maintenance costs.

Texaco Regal Oil (R&O) is specially refined from choice base stocks, then processed and fortified with special Texaco additives. *Texaco Regal Oil (R&O)* is thus *more than ten times more resistant to oxidation* than ordinary turbine-quality oils, gives far greater protection against rust and sludge, and will not foam.

There is a complete line of *Texaco Regal Oils (R&O)* approved by leading hydraulic manufacturers. A Texaco Lubrication Engineer will gladly show you how they can improve performance and reduce costs in your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

CATERPILLAR machines and earthmoving equipment are vital "arms" for America's defense. Their production brings into use a host of machine tools — presses, drills, automatics, and hones like the one in the picture. Where these are hydraulically controlled or operated, *Texaco Regal Oil (R&O)* as the hydraulic medium assures clean, trouble-free operation.

TEXACO Regal Oils (R&O)

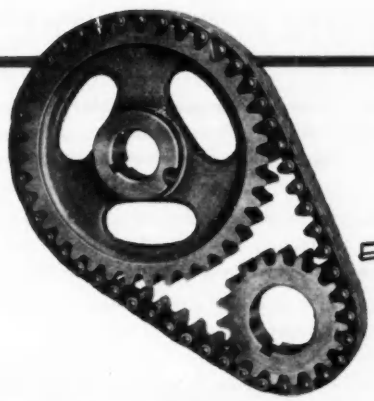
FOR ALL HYDRAULIC UNITS

Faithfully yours 50 *for Fifty Years*

Check list for better engine timing

☐ Automatic joint snugness ☐ Smoother operation ☐ Longer life

You get all 3* with Link-Belt Timing Chain



Why segmental bushings provide automatic joint snugness

Segmental bushings are made with slight bow.

After initial assembly in chain, bushings are straight.

Bow in bushing acts to keep a snug joint, maintaining chain pitch automatically.

WHEN you design with Link-Belt Timing Chains and Sprockets, you get exclusive engineering extras that result in smoother operation, longer life. Take a look at the accompanying sketches. They show you how Link-Belt's Segmental Bushings assure automatic joint snugness.

Put the continuing research and unsurpassed facilities of the vast, new Link-Belt plant to work for you. Engineering and specification details are available in Book 2065.

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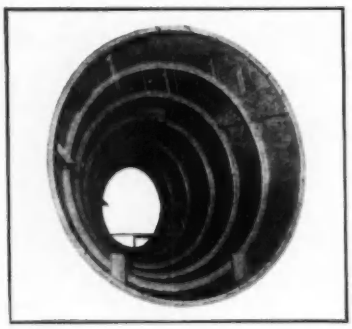
fuselage design *improved with* MAGNESIUM



Thick skin magnesium air frame construction offers many advantages.

The illustration at left shows how magnesium skin has simplified construction of this fuselage section. Note the absence of longitudinal stiffeners which not only makes production faster and easier but gives more interior space.

Other advantages of magnesium sheet and plate are greater torsional rigidity, high resistance to impact, less critical corrosion and better contours because thick skin permits flush riveting.

To meet critical problems of weight and rigidity, look to magnesium, the world's lightest structural metal.

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New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit
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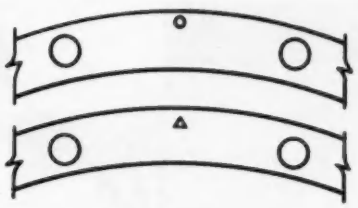
How to remedy common errors in gasket design

The fault

Very small bolt holes . . .
or small non-circular openings.



The reason

Centers from such holes probably require hand-picking. Because small holes are easy to miss, extra inspection must be employed. Naturally, this slows down gasket production and increases gasket costs.

The remedy

Avoid hole sizes under 3/32″ diameter. If hole is for indexing or positioning, it may be possible to change to a small notch.

For additional helpful information on the design and use of gaskets, read "Armstrong's Gasket Materials." This 24-page manual discusses subjects such as designing gaskets to reduce costs . . . designing flanges for efficient sealing . . . the effect of surface condition on gaskets, and many others.

You'll find, too, up-to-date information on Armstrong's various sealing and friction materials. Included are government and SAE-ASTM specifications. See this manual in Sweet's file for product designers. For a personal copy, write Armstrong Cork Co., Gaskets and Packings Dept., 1508 Arch St., Lancaster, Pa.

ARMSTRONG'S *Gasket Materials*

Eatonite-Faced Valves

an Important Advancement in Lengthened Valve Life

Eatonite—a heat resistant, corrosion resistant, and wear resistant alloy applied to valve faces by special Eaton-developed techniques—adds materially to valve life in commercial vehicles and heavy-duty industrial engines. An important factor in the outstanding performance records being set by Eatonite-faced valves is the homogeneous structure produced by the Eaton process of applying the hard-facing material. Eatonite-faced valves come well within practical limits from the standpoint of cost; pay for themselves many times over in lengthened life span and freedom from valve trouble. Best results are obtained when Eatonite-faced valves are used in conjunction with Eaton valve seat inserts.

Eatonite-Faced Valves are available as solid valves or as hollow sodium cooled valves.

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General Offices: CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

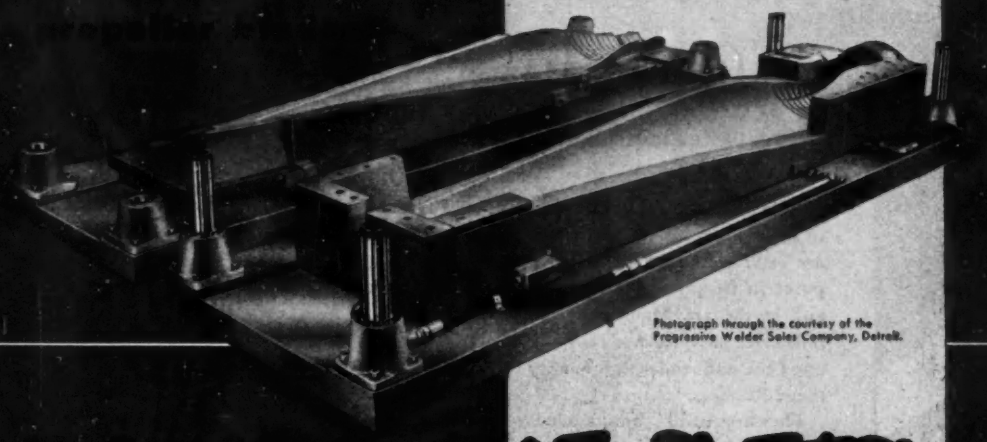
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

HOT FORMING

This unique new process takes a previously hot-worked billet and hot forms it into a one-piece hollow steel aircraft propeller. Now, in three steps requiring only a few minutes, a superior propeller is produced that formerly required hours of work.

The development gave rise to the problem of building a special 15 ton die that would provide a quenching action from 1450 degrees in a five minute press cycle.

For a die like this, the diemakers called for . . .



Photograph through the courtesy of the Progressive Welder Sales Company, Detroit.

E SETS

Reliable Danly precision plus unmatched facilities for the production of standard or special die sets like the one shown here make Danly Die Sets the first choice of diemakers everywhere. A nation-wide system of branch assembly plants* assures prompt, time saving service.

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2100 South Laramie Avenue, Chicago 50, Illinois

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NEAREST DANLY BRANCH
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DANLY

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on land, sea and in the air

Acadia Synthetic Rubber Products are once again in great demand for the nation's defense. They are serving in a large variety of important purposes in weapons and equipment on land, sea and in the air. Manufacturers in hundreds of industries have learned they can always depend upon the uniformly high quality of Acadia Synthetic Rubbers.

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sheets • tubing • strips • channel • washers • seals • bellows • gaskets • rings • extrusions • cut parts

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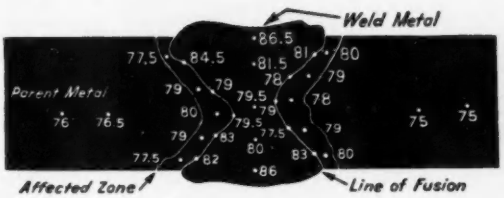


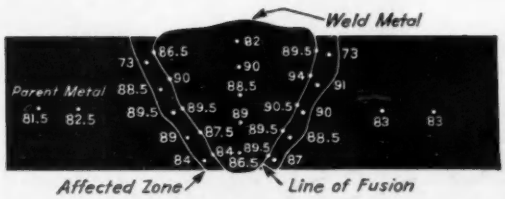
Rockwell B hardness on ½-in. manual arc-welded plate of Mayari R, stress-relieved at 1050 deg F.

Mayari R is a low-alloy, high-strength steel that can be welded by the ordinary methods used for plain carbon steel . . . electric-resistance, including spot-, seam-, and flash-butt . . . electric-arc, including metallic, carbon, and inert-arc . . . automatic-submerged-arc . . . and gas-welding processes.

There is no difference in the equipment, the technique, or the welding speed with Mayari R.

A non-air-hardening grade, Mayari R shows no appreciable hardening from welding temperatures. Results of tests made on welded Mayari R indicate that the welds are equally as strong as the parent metal.

Full information on welding and fabricating this steel is readily available for your files. Write or phone any Bethlehem sales office and ask for a copy of Mayari R Catalog 259.



Rockwell B hardness on ¼-in. manual arc-welded Mayari R plate, as welded.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

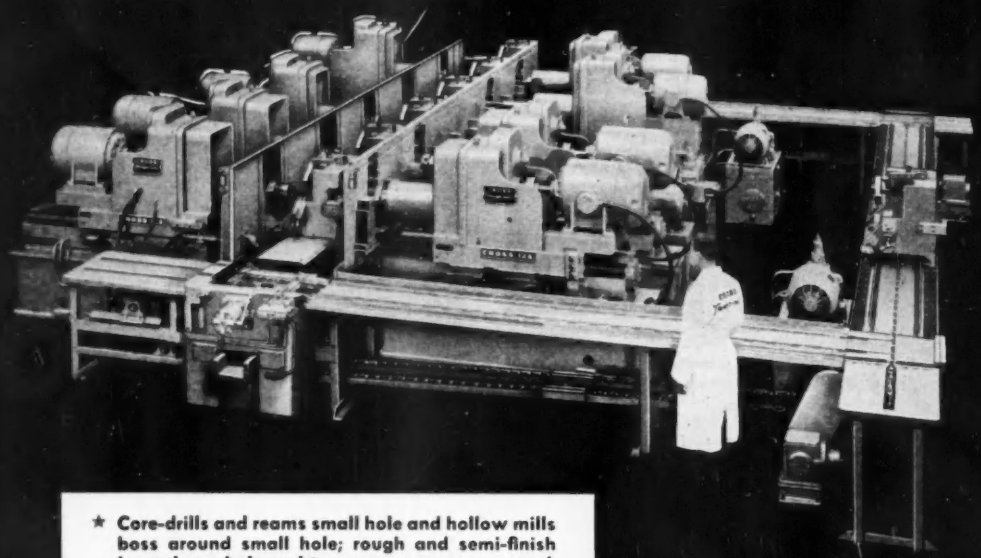
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

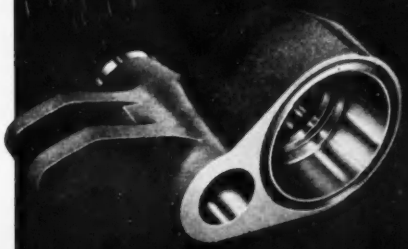
Mayari R *makes it lighter... stronger... longer lasting*

Bores, Hollow Mills and Trepans Tank Idler Arms

Another Transfer-matic by Cross



- ★ Core-drills and reams small hole and hollow mills boss around small hole; rough and semi-finish bores large hole and trepans groove on one end.
- ★ Cast Armor material—Rockwell C-36.
- ★ Six and one-half pieces per hour at 100% efficiency.
- ★ Six stations—one for loading, five for machining—with automatic transfer from station to station.
- ★ Palletized work holding fixtures hold part securely for all operations with integral conveyor returning fixtures from last station to loading station.
- ★ J.I.C. standard electrical and hydraulic construction with stranded wire.
- ★ Pre-set tools and Cross Cutter-Drive reduces downtime.



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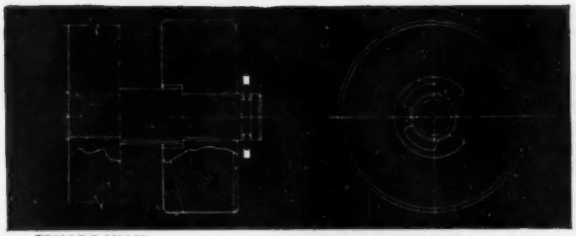
THE CO.

DETROIT 7, MICHIGAN

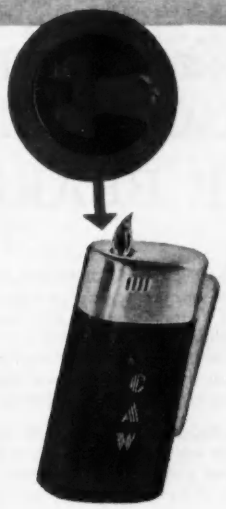
Special MACHINE TOOLS

WALDES TRUARC RINGS REPLACE COTTER PINS... SAVE 44% IN LABOR AND ASSEMBLY COSTS

COTTER PIN WAY: Flint wheel shaft in lighter assembly requires cotter pin, washer. Difficulty in drilling perfect hole causes rejects. Assembly is slow, costly.



TRUARC WAY: Waldes Truarc "E" ring fits into groove in shaft; locks assembly securely for life. Groove is quickly, easily cut... assembly is simple, speedy.



Brown & Bigelow, St. Paul, Minn., saved *$6.95 per thousand units* by incorporating Truarc Rings in the design for the REDI-FLAME compressed gas desk lighter! In spite of greater initial cost of Truarc Rings as against cotter pins, they were able to cut machining and assembly costs drastically—for an overall savings of 44%!

Redesign with Waldes Truarc Rings and you too will cut costs. Wherever you have a fastening problem... wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Truarc Ring designed to do a better job of holding parts together.

Waldes Truarc Rings are precision-engineered... quick and easy to assemble and disassemble. They can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

COMPARATIVE COSTS

Cotter Pin Way		Truarc Way	
Material	*$ Per M*	*Material*	*$ Per M*
Shaft	.48	Shaft	.35
Cotter pin	.46	Truarc ring	8.68
Washer	1.50		
	2.44		9.03
Labor		*Labor*	
Shaft	10.22	Shaft	2.27
Washer	.72		
Assembly	9.28	Assembly	4.41
	20.22		6.68
TOTAL	$22.66	TOTAL	$15.71

TOTAL SAVINGS WITH TRUARC RINGS: $6.95 or 44%

For precision internal grooving and undercutting... Waldes Grooving Tool.

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Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send engineering specifications and data on Waldes Truarc Retaining Ring types checked below. AY 084

- ☐ Bulletin #5 Self-locking ring types
- ☐ Bulletin #6 Ring types for taking up end-play
- ☐ Bulletin #7 Ring types for radial assembly
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- ☐ Send me information about the Waldes Grooving Tool.

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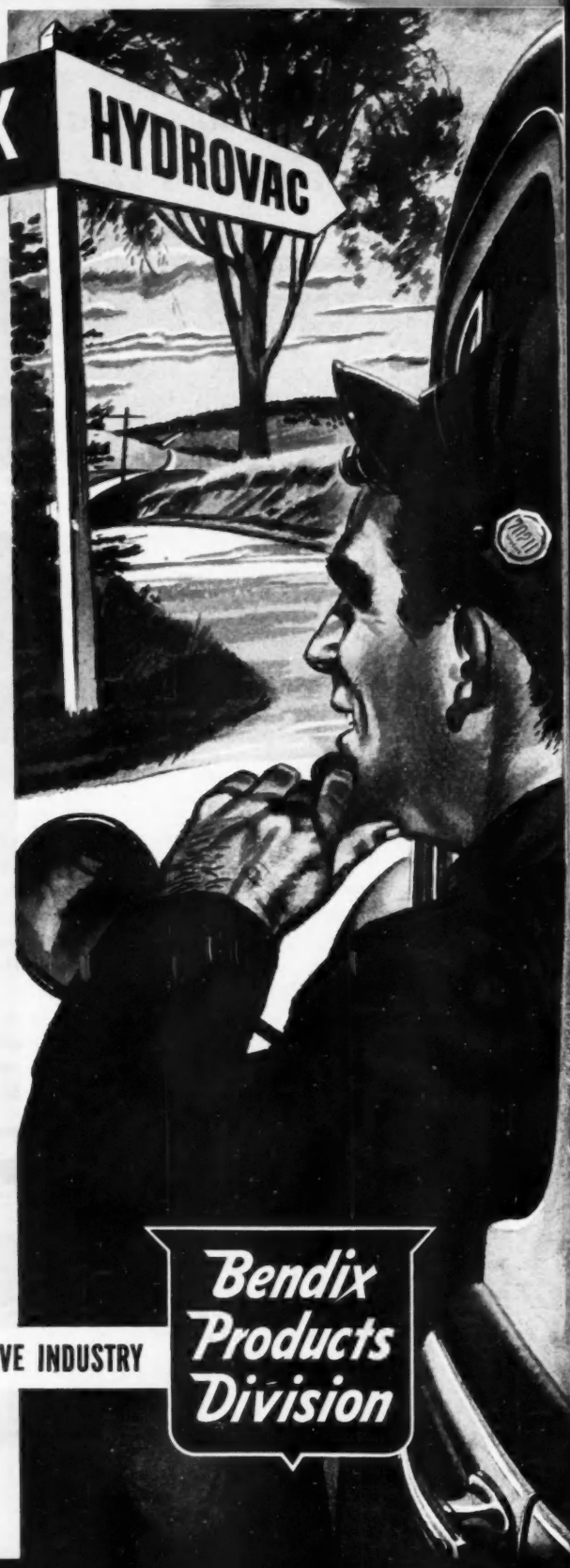


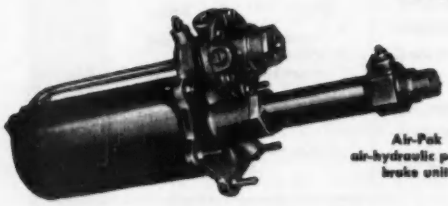
Either Way – YOU'RE ON THE ROAD TO BETTER POWER BRAKING!

There's no need to be puzzled about the question of efficient power braking for *any commercial vehicle*. Where the preference is for a hydraulic system, Hydrovac, with over two and a half million installations, has proven itself the undisputed leader in its field. And for vehicles where air actuated brakes are the choice, the new Bendix Air-Pak air-hydraulic power braking unit is foremost in its field.

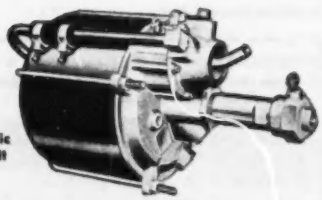
Air-Pak, similar in design and principle to the Hydrovac, changes air pressure into hydraulic pressure by means of two direct connected pistons, thus combining all the well proven advantages of hydraulic brake action with an air brake system.

Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and the air actuated units, brakes can be applied instantly by foot power alone—a safety factor of tremendous importance. Remember, regardless of size of vehicle or whether your preference is for vacuum or air actuated brakes, for the industry's finest power braking systems—specify Bendix* Hydrovac* or Bendix Air-Pak.

*REG. U. S. PAT. OFF.



Air-Pak
air-hydraulic power
brake unit



Hydrovac
vacuum-hydraulic
power brake unit

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High Spots of This Issue

New Records Established in 24-Hour Race at Le Mans

Despite a number of eliminations due to mechanical failures, some excellent sports cars finished this recent French classic with record-breaking achievements. Of special note were the high-quality parts and accessories used. See Page 32.

Materials Handling Problem in Making Earthmoving Pieces

Parts of the equipment required to move tons of soil are necessarily weighty and odd-sized, thus presenting unique materials handling problems. This article contains an analysis of how Caterpillar Tractor Co. has solved the puzzle. Page 34.

Great Fuel Savings Possible With Ideal Engine-Transmission

A transmission, designed to adjust the engine to the point of minimum specific fuel consumption, will aid future powerplants in attaining more efficiency. The authors visualize such an ideal device under typical operating conditions. Page 42.

Special Handling Setup for Buick Hood Production

Less hand labor and greater production economy are the prime elements sought in Buick's special setup for handling hoods. The machines and the operations involved in turning out these large stampings are fully described here. Page 48.

Honeycomb Panel Construction in Lightweight Trailers

In addition to excellent insulation properties, light-weight core materials provide high strength-weight and rigidity-weight ratios for airborne van-type trailers. Tables of their physical characteristics are included. See Page 50.

24 New Product Items And Other High Spots, Such As:

New jet delivers thrust of 9750 lb; highlights of Nash's half-century; jet engine combustion chambers made to close tolerances; windless wind tunnel; new tractor engine convertible for different fuels; where weldments reduce scrap losses; Patton 48 tank features revealed; quality control in a large body plant; and special sheet aluminum for automotive radiators.

Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

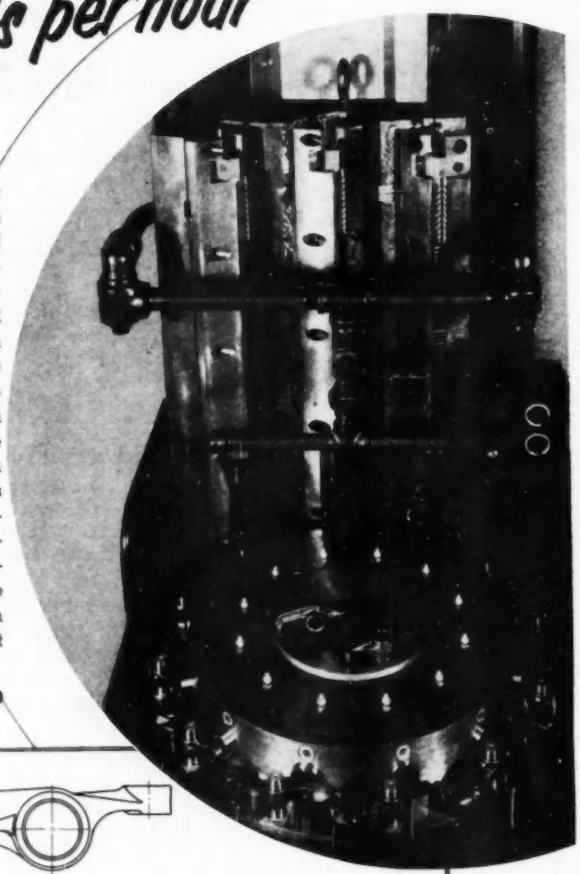
AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

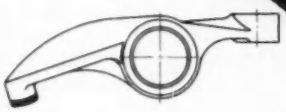
Hydro-Broaching with Rotary Index Fixture

Nets 1550 parts per hour

The equipment illustrated here is highly productive because it's largely automatic. The operator merely removes the broached parts and reloads the fixture as it automatically indexes in front of him. 1550 parts are broached per hour. ¶To attain this high rate of production, Cincinnati Application Engineers tooled up a CINCINNATI No. 5-42 Single Ram Vertical Hydro-Broach Machine with a three unit broach holder, for broaching three parts each stroke of the ram. The machine table is replaced with a hydraulic index fixture which holds twelve parts. Clamping is automatic. The operating cycle repeats continuously: broach three parts, index 31°, return ram, index 59°. This equipment is a high production, low-cost installation, safe and easy to operate. ¶Although CINCINNATI Hydro-Broach Machines are in short supply at this time, you might like to know more about their application. Write for publication M-1559-1. It contains many examples of low-cost broaching setups.

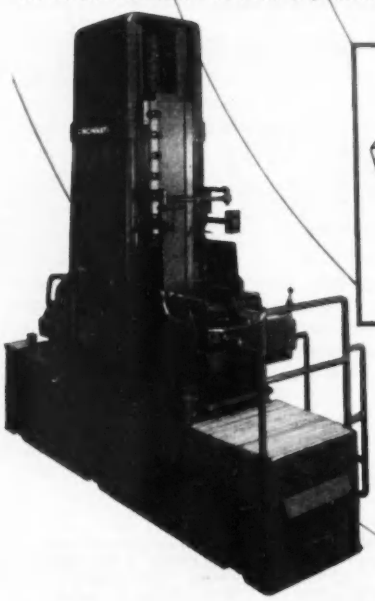
THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO





Drawing of part. Heavy line indicates broached surface. Production data:

Part Name . . . . Valve rocker arm
Material . . . . . Steel forging
Operation . . . . Broach convex pad
Production . . . . 1550 per hour
Equipment . . . . CINCINNATI No. 5-42 Single Ram Vertical Hydro-Broach Machine with built-in automatic fixture



CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach Machine. Nos. 5-42, 5-54 and 10-54 sizes also available. Write for new catalog No. M-1745.

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 107, No. 3 **August 1, 1952**

Packard to Offer Power Steering

Packard Motor Car Co. is the latest automobile manufacturer to enter the field with power steering, according to reliable reports. OPS has approved a wholesale price of $185 for the unit, indicating that it will be offered soon, possibly on some 1952 models. It is understood that the power steering device will be supplied by Bendix.

GM Orders Aircraft Tools from France

General Motors Corp. has ordered more than a $1 million worth of machine tools from France to speed tooling for aircraft engine production at the Chevrolet plant, in Tonawanda, N. Y. The order calls for 172 drills, 10 of which already have been delivered.

Fairchild Licensed to Build Fokker S-14 Jet

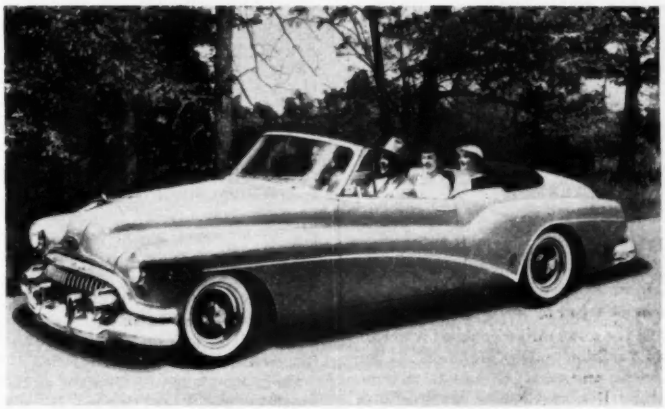
Fairchild Engine & Airplane Corp. recently announced an agreement with Fokker Aircraft Corp., Amsterdam, Holland, to build the Fokker S-14 jet trainer. The S-14 is a two-place, side-by-side plane powered by a Rolls-Royce Derwent engine.

Olds, Cadillac to Present Air Conditioning in 1953

General Motors Corp. has announced that an air-conditioning unit will be made available at extra cost on the 1953 Cadillac and Oldsmobile models.

The units will be produced by Frigidaire Div. and are basically the same in principle as cooling systems used in offices and on trains. A rotary compressor is mounted on and driven by the engine, with a sealed refrigeration unit mounted on a shelf in the trunk.

Non-toxic Freon refrigerant is used, and the unit is compact in design so that it does not appreciably reduce luggage space. A single dash-mounted control is used to regulate temperature.



NEW SPORTS CONVERTIBLE

Designed by Buick Motor Div. of General Motors Corp., the new sports convertible above is built on a 1952 Roadmaster chassis and is powered by a Fireball engine. Special features include chrome-plated wire racing wheels, down-swept doors harmonizing with lines of the fenders, which are cut out to reveal the wheels, and lower interior seats. Named the "Skylark", it will be pre-tested for public acceptance.

Alcoa Predicts Aluminum Radiator in Five Years

Although pressure for an aluminum radiator has eased with the improvement in the copper supply, Aluminum Co. of America predicts that an aluminum radiator for cars may be available within the next five years.

The company says that an aluminum brazing sheet, recently developed, offers satisfactory protection against corrosion. Radiators made of the alloy-clad aluminum now are under test.

Navy Cancels Chrysler Jet Engine Contract

Chrysler Corp. will not build J-48 jet engines for the Navy, as previously planned. Due to a change in its aircraft requirements, the Navy has cancelled the contract. However, a huge plant north of Detroit, Mich., being built by Chrysler for the Navy, will be completed and operated by Chrysler for other defense work. It will measure nearly two million sq ft in area and will constitute a major defense facility.

Since it has been released from producing jet engine parts, Chrysler's Indianapolis, Ind., plant will be utilized for its original purpose, to manufacture automobile transmissions.

New Aluminum Trailer Revealed by Fruehauf

Fruehauf Trailer Co. is now producing a new, smooth-panel aluminum van trailer which is said to feature unusual lightness for bigger pay loads, without sacrifice of strength.

Design and construction principles used in aircraft engineering have reportedly been adopted for this new road vehicle. Among these are the use of monocoque construction and the employment of extruded aluminum shapes for strength and rigidity with a minimum of weight.

News of the AUTOMOTIVE

Fisher Tank Contract Totals $608 Million

The contract for Patton T-48 tanks held by Fisher Body Div. of General Motors Corp. has been increased by more than $104 million to bring its total commitments for the new tank to more than $608 million.

Automotive Defense Orders Continue

New defense contracts continue to come into the automotive industries. Continental Motors Corp. has been awarded a $19 million contract for power plant assemblies. Ternstedt Div. of General Motors Corp. has received an additional order of $13.5 million for range finders, bringing its total commitments for that item to $53 million. The Cadillac tank contract has been enlarged by about $27 million.

Other automotive contracts include $44.4 million to Reo Motors, Inc., for vehicles and parts; $5 million to Oldsmobile Div. of General Motors Corp. for 3.5 in. rockets; and $4.1 million to Kelsey-Hayes Wheel Co. for shell parts.

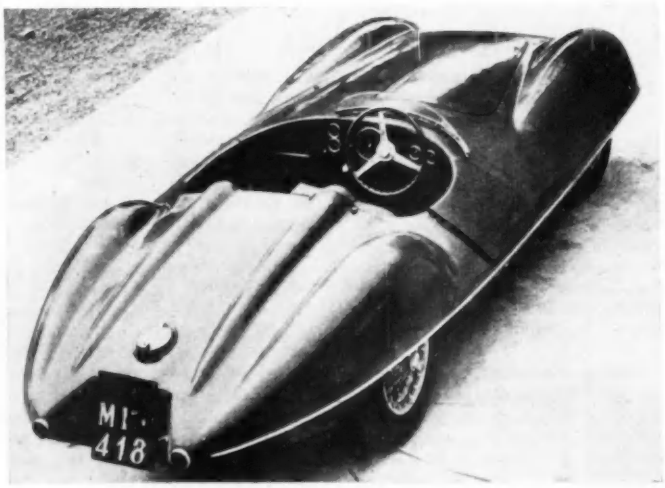
Ford Motor Co. has been awarded $4.2 million more for T-48 tanks, and more than $4 million for additional 3.5 in. rockets. Studebaker Corp. has had its truck contract increased by more than $3.1 million for vehicles and spare parts.

Additional defense orders totaling more than $2.3 million have been awarded to ACF-Brill Motors Co. for parts, power units, helicopter transmissions, and servicing and testing of engines.

General Tire Buys Crosley Motors

General Tire and Rubber Co. has bought control of Crosley Motors, Inc., from the Crosley family, according to a recent announcement. An exchange of stock, said to represent a purchase price of about $63,000, gives the rubber company a presently inactive automobile assembly plant in Marion, Ind., and an engine plant in Cincinnati, O.

Upon completion of an audit of the Crosley books, Powel Crosley, Jr., will reportedly retire as president and treasurer, while his brother, Lewis M. Crosley, is to remain as vice president and become treasurer.



ITALIAN SPEEDSTER

This new streamlined Alfa-Romeo model, now under test at the company's Milan, Italy, factory, is powered by a 183 cu in., six-cyl engine with three double-body carburetors. It reportedly can develop close to 200 hp and attain a top speed of 120 mph.

Supply of Nickel for Cars Clouded

There appears to be considerable confusion about the supply of nickel for automobile trim where its use is still permitted, principally in bumpers and hub caps.

Some reports say that nickel allocations will be reduced because of greater demand from jet engine programs now getting started. On the other hand, the nickel industry is producing at an all-time high of about 23 million lb a month.

The answer to the question probably lies with the decision of whether jet engine production will be set at a high rate, or extended over a longer period.

Government to Finance Molybdenum Recovery

Under an agreement between the Government and Climax Molybdenum Co., 50 million lb of molybdenum will be recovered from low grade ores that otherwise would not be refined.

Climax will spend up to $9.5 million for processing facilities and the Government will buy the metal at up to 24 cents a lb above the current market price and place it in the national stockpile.

Avro Anti-Submarine Plane Passes its Initial Trials

Britain's new anti-submarine plane, the Avro Shackleton Mark II, passed its first flights recently. A more powerfully armed and streamlined version of the Shackleton Mark I, the plane is powered by four Rolls-Royce Griffon engines and carries a crew of 10.

Allis Chalmers Expands Springfield, Ill., Unit

Allis-Chalmers Manufacturing Co. will spend approximately $15 million in expanding its Springfield, Ill., works. The cost will include a new 300,000 sq ft production building, an office building of nearly 35,000 sq ft and additional tools and machinery, plus relocation of existing machinery and equipment.

The program is expected to be completed by late next year. The facility will be used to produce crawler tractors, motor graders, and service parts.

AND AVIATION INDUSTRIES

Steel Price to Rise at Least $5 Per Ton

Latest reports at press time indicate that prices of steel will increase a minimum of $5 a ton, as a result of the July 24 steel strike settlement. In recent conferences between the Government and the steel industry, the companies have insisted that they would require considerably more than $5 per ton to compensate for the cost of wage and fringe benefit increases.

Government spokesmen, however, appear equally insistent that $5 to $5.25 will be the maximum. The increases, even at that level, would exceed allowable increases under the Capehart Amendment by about $2.25 a ton and would be authorized to cover both the wage settlement and the seven per cent increase in freight rates effective in May.

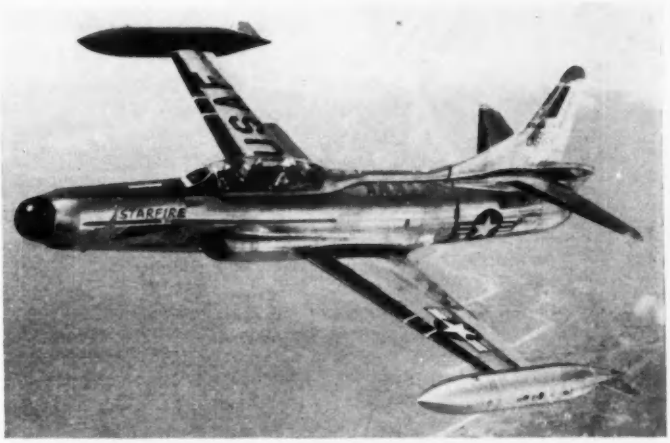
Automobile Credit Takes Big Jump

Automobile installment credit increased by $193 million during May, the largest jump for any class of credit, after the lifting of consumer credit controls on May 7. In addition, it is estimated that a considerable portion of the $163 million increase in other installment loans was used to finance automobile purchases.

Traffic Deaths Now Exceed Fatalities in All Wars

The nation's military deaths in all wars since 1775 had reached a total of about 1,005,600 at the end of two years of war in Korea, according to a recent estimate by the Association of Casualty and Surety Companies.

The Association's comparative study of war and traffic deaths showed, however, that the total of highway fatalities since the first automobile accident victim was killed in New York City 52 years and nine months ago is now far ahead of the all-time war total. Since February, when the total of lives lost in highway accidents equalled military fatalities for the first time, the historic toll of 1,018,500 traffic deaths has surged 13,000 above the nation's war fatality toll of 1,005,600.



ROCKET-EQUIPPED INTERCEPTOR

The F-94C Starfire, latest all-weather interceptor being built for the Air Force by Lockheed Aircraft Corp., is said to be the first plane armed only with rockets (24 in the nose), which are fired automatically. Complex electronic equipment also enables it to locate and track down enemy aircraft. Other features include a thin, straightwing, swept-back tail, and landing parachute. Powered by a P&W J-48 turbojet engine, it has a speed of over 600 mph and a ceiling of 45,000 ft. plus.

Oil Industry Planning $4 Billion Expansion

Despite a continuing rise in the use of petroleum products, the oil industry appears to be well able to meet all civilian and military demands. It will spend more than $4 billion this year on an expansion program, said to be the greatest capital expenditure for any one year in the history of the industry.

Expenditures this year will be about 25 per cent more than the $3.27 billion spent last year and will bring to $19 billion the capital investment for expansion since 1945.

Use of petroleum products in this country has increased 73 per cent in the last decade and 43 per cent since 1946. It is estimated that motor vehicles consume about 44 billion gallons of gasoline a year.

GMC Builds Commercial Trucks for Military

Further evidence that military planning includes use of commercial type trucks wherever possible to replace more costly tactical vehicles is seen in the latest order received by GMC Truck and Coach Div. of General Motors Corp.

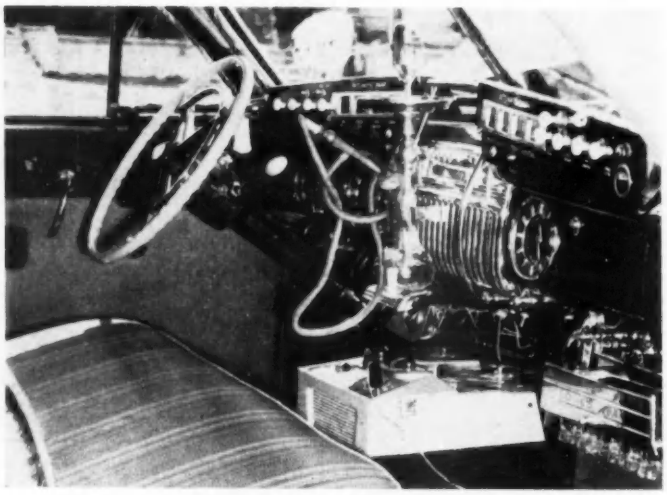
The company has been given military contracts totaling more than $5.2 million for commercial trucks to be used by the Navy and Air Force. The order includes a considerable number of Diesel trucks and tractors, and the GMC gasoline model powered by its new 302 cu in. engine. This power plant is used in the 2½ ton 6x6 military truck.

Ford Considers Court Fight on NPA Ruling

Ford Motor Co. has hinted that it is considering court action to reverse NPA's rejection of its appeal for a larger share of the industry's production.

NPA turned down Ford's plea on the grounds that the base period used for determining allocations was representative and of sufficient length to account for competitive trends; Ford's contention of a loss in competitive position with respect to General Motors Corp. and Chrysler Corp. was not valid; and that Ford's arguments of hardship were anticipatory rather than present.

News of the AUTOMOTIVE



CAR WITH EVERYTHING PLUS

A car truly loaded with accessories is this 1947 Cadillac owned by Louis Mattar of San Diego, Calif. The tape recorder, Turkish water pipe, and electrically controlled whisky and soda bar shown in the photo are but a few of the gadgets installed in the car. Others include a hot and cold shower, washing machine, medicine cabinet, refrigerator, dining table, drinking fountain, public address system, telephone, electric barbecue grill, and kitchen sink. Two heavy storage batteries supply current for electrical equipment, while two 25-gal tanks under car supply necessary water.

Alcoa and Union Agree on New Contract Terms

Aluminum Co. of America and the International Council of Aluminum Workers Unions, AFL, recently completed negotiations for a five-year contract covering 9500 workers at six plants.

The new pact contains a cost-of-living escalator clause, a feature new to aluminum industry wage agreements. Since the contract's money features must be approved by the Government before they go into effect, the new contract is presently in the nature of an interim agreement.

Northrop Aircraft Buys Radioplane Co. Stock

Northrop Aircraft, Inc., has concluded arrangements to acquire 100 per cent of the stock of the Radioplane Co., Van Nuys, Calif., a manufacturer of radio-controlled target planes.

Radioplane will continue its production of target aircraft, along with its research and development work, as a new division of Northrop. The former has military contracts totaling $18.8 million.

New Bomb Shape to Aid Combat Plane Speeds

A new universal bomb shape, designed for external use on many modern combat planes, will permit flight at 50 mph faster than when the World War II type bomb is used, according to a recent announcement by the Navy.

The streamlined aerial shape was designed for the Navy's Bureau of Aeronautics by Douglas Aircraft Co., Inc. Said to be engineered to a high degree of aerodynamic refinement, the new shape has reportedly replaced bomb shapes originated 25 years ago when airplanes flew little more than 100 mph.

The shape is carefully contoured for lowest drag possible when installed on transonic or supersonic aircraft, the Navy said. Fuel tanks on the Navy's new F3D Skyknight night fighter are formed to this shape and have been undergoing flight testing by the Navy and Douglas.

End of Expansion at Harrison Near

The $3.93 million expansion program at the Lockport, N. Y., plant of Harrison Radiator Div. of General Motors Corp. is said to be nearing completion. A new building will provide an additional 350,000 sq ft of space for the manufacture of defense products.

COOL COMFORT

In spite of sizzling summer heat outside, technicians of Chrysler Corp.'s Engineering Div., don winter garb to test cars in a "cold room." Temperatures as low as —40F can be created here.

AND AVIATION INDUSTRIES

Standard to Set Up Plant in Brazil

Standard Motor Co., Ltd., has announced that it will erect an automobile assembly and manufacturing plant in Brazil. Expected to cost over $8 million, the plant will reportedly be jointly financed by Standard and Brazilian funds. It will first assemble cars and other vehicles and will eventually manufacture cars when steel supplies increase.

Financing Methods Shown in City Parking Survey

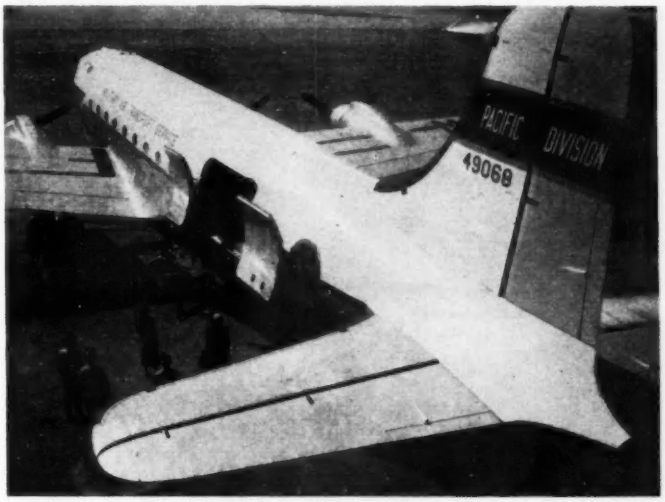
A survey of financing methods for urban parking facilities is now available to interested communities. The study, a joint project of the National Retail Dry Goods Association and the Automotive Safety Foundation, shows the methods 27 cities used to finance their off-street parking facilities.

Examples of private, public, and joint financing are described in "Parking—How It Is Financed," available from the NRDGA office, 100 West 31st St., New York 1, N. Y. Price is 75¢ per copy.

Westinghouse Autopilot Used on New Jet Plane

The first automatic pilot with unlimited maneuverability is installed in the new F-94C Starfire jet warplane that Lockheed Aircraft Corp. announced recently. It was developed by the Westinghouse Electric Corp. in cooperation with the Air Material Command's Armament Laboratory, Control Equipment Branch.

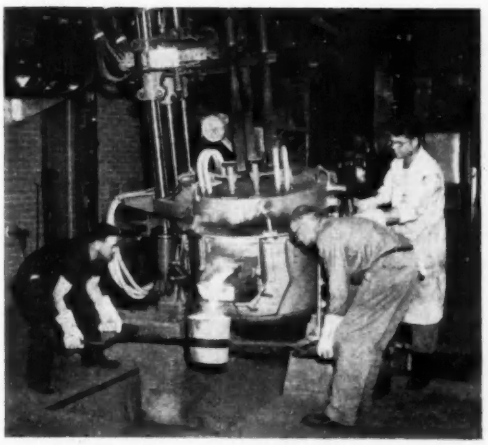
Manufactured by Westinghouse's Air-Arm Div., the automatic pilot is described as utilizing three "nontumbling" gyroscopes that are locked to the plane. These gyroscopes, spinning at 12,000 rpm, reportedly follow the plane's movements during all maneuvers without any possibility of tumbling.



Authenticated

DOUGLAS STRETCHER LIFT

A new electrically operated stretcher lift, developed by Douglas Aircraft Co., is reportedly easily attached and adjustable to any type of transport plane. The two-patient unit is said to weigh less than 75 lb and may be easily stowed in the plane.



GM FURNACE

A melt is poured from the largest furnace in the General Motors Research Laboratories Metallurgy Dept. building at the GM Technical Center. (See p. 18, July 15 issue of AUTOMOTIVE INDUSTRIES.) Capacity of this three-phase, direct-arc furnace is approximately 1700 lb. A special exhaust system removes all gases, even when the furnace is being tipped for the pour.

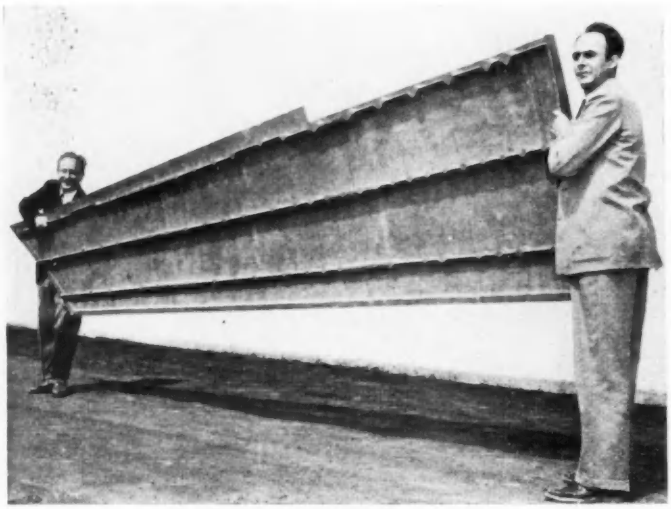
Critchfield Named to Succeed Lenz

Robert M. Critchfield has been named general manager of Pontiac Motor Div. of General Motors Corp. to succeed the late Arnold Lenz. Mr. Critchfield comes to Pontiac from Allison Div., where he had been assistant general manager since January, 1951.

Du Pont Celebrates 150th Anniversary

E. I. du Pont de Nemours and Co. marked its 150th anniversary on July 18 at the site of the first du Pont mill near Wilmington, Del. Several thousand guests heard remarks by Crawford H. Greenwalt, president, at ceremonies that included a historical drama and selections by the du Pont band and chorus.

News of the AUTOMOTIVE



MAMMOTH MAGNESIUM CASTING

Northrop Aircraft, Inc., with the cooperation of Aluminum Co. of America, has succeeded in casting this 16-ft airplane wing section in a single piece from AZ-92 magnesium. Part of a research project for the Air Force, it is said to be the largest aircraft surface ever produced. No details of casting method have been disclosed.

1952 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According of the 1952 Five Months' Totals

MAKE	May 1952	April 1952	May 1951	FIVE MONTHS Units 1952	Units 1951	Per Cent of Total 1952	Per Cent of Total 1951
Chevrolet	87,033	75,695	98,001	361,094	510,681	21.05	21.70
Ford	70,670	73,311	83,330	286,835	407,629	16.71	17.32
Plymouth	45,237	37,417	57,105	188,367	246,199	10.98	10.46
Buick	31,040	28,424	34,465	130,995	186,046	7.63	7.99
Pontiac	26,236	22,284	28,515	107,175	157,038	6.24	6.67
Dodge	27,662	20,776	26,837	99,672	130,409	5.81	5.54
Oldsmobile	22,062	19,918	25,923	92,120	129,574	5.37	5.50
Studebaker	16,333	13,819	17,385	74,131	89,353	4.32	3.80
Mercury	18,240	16,478	22,302	72,977	107,199	4.25	4.55
Nash	15,478	12,153	11,410	55,487	55,353	3.23	2.35
Chrysler	11,434	10,455	16,170	49,616	72,121	2.89	3.06
De Soto	9,150	8,580	10,355	38,636	48,272	2.25	2.05
Cadillac	8,302	7,661	8,301	33,716	43,464	1.96	1.85
Hudson	8,270	6,781	9,010	32,069	49,672	1.87	2.11
Packard	6,899	6,418	5,504	27,756	31,447	1.62	1.34
Kaiser	3,868	3,417	4,356	15,846	26,807	.92	1.14
Henry J	4,435	2,369	4,867	13,451	26,206	.78	1.11
Willys	3,876	2,889	2,227	13,310	11,516	.78	.49
Lincoln	2,808	2,656	2,119	9,669	11,721	.56	.50
MG (British)	688	538		2,401		.14	
Austin (British)	540	402	250	2,110	1,516	.12	.06
Hillman (British)	404	387		1,668		.10	
Crosley	374	371	479	1,552	2,600	.09	.11
Ford (British)	327	294	274	1,473	1,206	.09	.05
Jaguar (British)	245	258		1,071		.06	
All State	178	107		567		.03	
Misc. Domestic	50	91	216	806	748	.05	.03
Misc. Foreign	378	339	1,025	1,660	5,134	.10	.22
Total—All Makes	422,217	374,288	470,446	1,716,220	2,353,921	100.00	100.00

* Based on data from R. L. Polk & Co

$200 Per Share Value Set on Ford Stock

Class A Ford Motor Co. stock is valued at $200 per share, according to an inventory of the estate of Mrs. Clara B. Ford, widow of Henry Ford, filed recently in probate court at Detroit, Mich.

An appraisal of the estate listed 63,260 shares of the stock at a value of $12,652,000. Total value of the estate was appraised at $18,794,861.

Cleveland Graphite Bronze Forms Sales Corporation

A wholly-owned subsidiary corporation named Clevite Service, Inc., with headquarters at 6545 Carnegie Ave., Cleveland, O., has been formed by Cleveland Graphite Bronze Co. to take over the business of its Replacement Sales Div.

Willys Military Orders Increased $27 Million

Willys-Overland Motors, Inc., has received an additional $27 million order for military jeeps from the Ordnance Corps. Total backlog of unfilled orders, including civilian products, now stands at about $275 million.

Grand Industries Merges With Cleveland Hobbing

Cleveland Hobbing Machine Co. and Grand Industries, Inc., will merge after approval by stockholders of both companies. The new corporation will be known as the Cleveland Hobbing Machine Co.

Under the merger agreement, holders of Cleveland Hobbing will receive 2.2 shares of stock in the new merged corporation for each share of their old Hobbing stock.

Grand Industries stockholders will be given stock on a 1-for-1 basis. Four Grand Industries divisions—Foundry, Grand Stove, Enameling, and Shell Forging—will operate as divisions of the new corporation.

New Metal Seat Backs for Military Buses

Rigidized Metals Corp. announces it is supplying Rigid-Tex metal seat backs for Twin Coach military buses. The stainless metal is of three-dimensional design for flexural rigidity.

AND AVIATION INDUSTRIES

NSPA Rebuilders Division Formed

The National Standard Parts Association has announced the formation of an Automotive Parts Rebuilders Div. The new division has been formed largely in the interests of wholesalers to assure them satisfactory and reliable sources of supply for rebuilt units.

New Cylinder Builder is Organized in Wis.

A new concern, Allis Hydraulic Products, Inc., has been organized to design and build air and hydraulic cylinders. Main offices are located at 1721 East Lake Bluff Blvd., Milwaukee, Wis., with manufacturing facilities at Waukesha, Wis. Sales will be handled through manufacturers' agents established in principal cities.

Ohio Crankshaft Unit Opens New Offices

Tocco Div. of Ohio Crankshaft Co. has announced the opening of a new West Coast office at 3349 Union Pacific Ave., Los Angeles, Calif.

The division's Chicago, Ill., office has moved to much larger quarters at 6600 South Nashville Ave.

Tourek Completes Move to New Chicago Plant

J. J. Tourek Mfg. Co. recently completed its move into a new $650,000 factory building at 1901 South Kilbourn Ave., Chicago, Ill.

Especially designed to speed production and minimize material handling, the building contains approximately 60,000 sq ft of floor space.

Willys Adds Two Forge Hammers

Willys-Overland Motors, Inc., has put into production two new 42,000-lb forge hammers for fabrication of air frame and engine parts for jet planes. The new hammers are officially rated at 35,000 lb, but Willys lengthened the stroke to increase the capacity by 7000 lb.

Nine additional hammers are yet to be installed with capacities from 5000 to 35,000 lb. They will add 100 million lb to the present capacity of 102 million lb of forgings annually.

1952 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1952 Five Months' Totals

MAKE	May 1952	April 1952	May 1951	FIVE MONTHS Units 1952	Units 1951	Per Cent of Total 1952	Per Cent of Total 1951
Chevrolet	24,842	24,391	33,297	108,784	149,310	33.23	34.84
Ford	16,605	17,886	23,261	75,717	105,904	23.12	24.71
Dodge	7,979	8,188	9,009	38,728	45,862	11.83	10.70
International	8,113	8,277	7,546	37,320	39,720	11.40	9.27
G. M. C	6,956	7,025	8,672	32,145	43,033	9.82	10.04
Studebaker	2,615	2,534	2,435	11,646	12,966	3.56	3.03
White	936	976	1,170	4,603	5,994	1.41	1.33
Willys Truck	881	909	1,335	4,323	6,972	1.32	1.63
Willys Jeep	663	715	679	3,202	3,862	.98	.86
Mack	587	785	948	2,976	5,061	.91	1.18
Diamond T	314	349	481	1,588	2,145	.48	.50
Divco	256	256	359	1,306	1,803	.40	.42
Reo	247	265	294	1,259	1,694	.38	.40
Brockway	150	153	206	701	1,190	.21	.28
Autocar	115	147	222	671	998	.20	.23
Federal	50	98	133	335	541	.10	.13
Kenworth	58	71	66	309	312	.09	.07
Pontiac	31	41	52	245	305	.07	.07
F. W. D	39	40	37	233	222	.07	.05
Sterling	18	37	40	113	181	.03	.04
Peterbilt	20	23	33	98	156	.03	.04
Misc. Domestic	150	222	135	1,024	689	.31	.16
Misc. Foreign	34	71	29	161	107	.05	.02
Total—All Makes	71,690	73,481	90,627	327,481	429,514	100.00	100.00

* Based on data from R. L. Polk & Co.

Five Months' Retail Car Sales Valued at $3,568,000,000*

Price Group	May, 1952 Sales Units†	% of Total	Dollar Volume Dollars	% of Total	Five Months 1952 Sales Units†	% of Total	Dollar Volume Dollars	% of Total
Under $2,000	218,979	52.19	$387,443,756	43.74	910,907	53.42	$1,607,095,850	45.03
$2,001 to $2,500	121,497	28.96	266,939,394	30.36	525,164	30.80	1,165,202,798	32.65
$2,501 to $3,500	61,027	14.55	163,974,770	18.47	201,748	11.83	548,770,505	15.38
Over $3,500	18,026	4.30	65,829,796	7.43	67,428	3.95	247,612,981	6.94
Total	419,528	100.00	$885,787,716	100.00	1,705,247	100.00	$3,568,681,841	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

1952 MOTOR VEHICLE FACTORY SALES*

	Passenger Cars	Trucks	Buses	Totals 1952	Totals 1951
January	273,572	101,060	778	375,410	606,833
February	333,885	100,706	625	435,216	618,321
March	373,231	109,173	569	482,973	755,022
April	416,155	112,833	587	529,585	639,272
May	397,036	106,586	423	503,045	652,727
Total—Five Months	1,794,079	529,358	2,992	2,327,029	3,272,175

1952 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,000-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	36,127	17,832	5,914	22,409	8,368	9,176	4,234	101,060
February	34,456	18,114	6,291	23,278	8,149	9,132	4,327	100,706
March	30,721	19,482	5,857	24,347	5,992	10,076	8,029	109,173
April	43,393	22,313	5,670	21,969	4,660	10,041	4,797	112,833
May	40,010	22,934	5,678	19,243	4,428	9,978	3,315	105,586
Total—5 Mos. 1952	191,706	100,645	29,370	111,236	26,297	48,403	21,701	529,358
Total—5 Mos. 1951	280,523	120,186	50,997	118,823	30,673	32,729	17,653	651,774

*—Automobile Manufacturers Association.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Steel Strike Disrupts Auto Production Plans

The steel strike has thrown the automobile industry's production plans for the rest of this year out of kilter. Under present NPA quotas and expected allocations for the fourth quarter, the industry had hoped to build possibly 2.5 million cars during the last six months of this year.

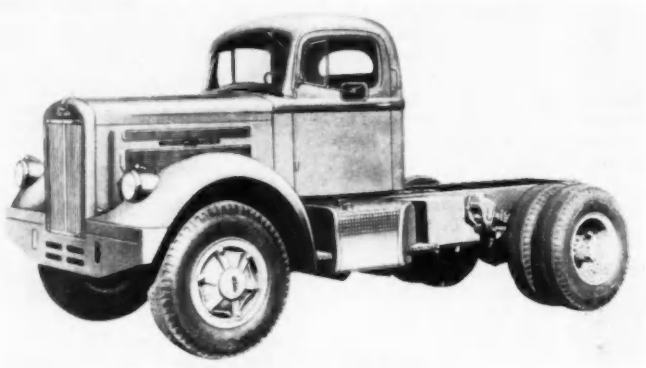
However, with most of the industry blacked out at press time, third-quarter production will probably fall far short of the 1,050,000 cars permitted. Furthermore, there seems to be little hope that output will equal that of the first half of the year.

Desperate Steps

To offset part of the loss, manufacturers are said to be making heavy commitments for conversion steel and lining up steel from foreign countries. However, it is reported that military officials are bringing heavy pressure on NPA to cut the industry's allotment by 20 per cent under what previously had been scheduled for the fourth quarter to authorize steel for only 980,000 cars.

Outlook Bleak

General opinion is that steel will be scarce for the next six months, and, even though the automobile industry has capacity to make up its losses, the metal will not be there. Inventories have been badly depleted and the product mix thrown out of balance, so that there will be many difficulties in getting an orderly flow of production until several weeks have elapsed after the strike.



NEW WHITE TRACTOR

A new White tractor, Model WC-24PLT, is powered by a 180-hp engine with stellite faced intake valves and a new exhaust system with both dual exhaust and inlet to exhaust muffler. The tractor is available in 140, 146, and 158 in. wheelbase sizes.

Car Shortages

Meanwhile, stocks of new cars in dealers' hands have declined steadily and are at a relatively low point. As a result, dealers have tightened their trading policies, the supply of used cars is falling off, and prices are rising.

It looks as though there would be a shortage of new cars for the next several weeks, at least, but not to the extent that it existed in 1946, 1947, and 1948. For one thing, the industry has built more than 29 million cars since the end of the war, so the shortage of late models is not as acute as it was right after the war.

Federal-Mogul Cites Its 15-Year Growth

Federal-Mogul Corp., in its latest report to stockholders, reveals that in the last 15 years its net worth has risen from about $2 million to $15.355 million. The number of stockholders in the same period has increased 174 per cent, to 2239.

Earnings before taxes during the last 15 years have risen from $447,223 to $8.76 million. Since 1939, the stock has been split twice, by a 3 for 2 and 2 for 1 ratio, with total shares outstanding now totaling 559,192.

(*Turn to page* 118, *please*)

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	May 1952	April 1952	May 1951	Five Months 1952	Five Months 1951	Per Cent Change: May over April	Per Cent Change: May over May 1951	Per Cent Change: Five Months 1952 over 1951
1	New England	26,211	24,049	27,862	100,815	137,433	+ 8.99	− 5.93	−26.64
2	Middle Atlantic	82,882	76,005	97,674	322,758	442,236	+ 9.05	−15.14	−27.02
3	South Atlantic	46,986	42,097	51,900	205,579	277,471	+11.61	− 9.47	−25.91
4	East North Central	105,484	97,799	122,730	443,619	618,421	+ 7.86	−14.45	−28.27
5	East South Central	19,044	16,751	19,486	80,343	108,629	+13.69	− 2.27	−26.04
6	West North Central	40,254	37,245	50,483	169,711	243,801	+ 8.08	−20.26	−30.39
7	West South Central	36,431	30,806	38,838	153,591	205,970	+18.25	− 1.10	−25.43
8	Mountain	13,348	13,831	14,799	56,655	78,627	− 3.49	− 9.80	−27.94
9	Pacific	51,577	35,703	48,674	183,149	241,313	+44.46	+ 5.96	−24.10
	Total—United States	422,217	374,288	470,446	1,716,220	2,353,921	+12.81	−10.25	−27.09

States comprising the various regions are:—Zone 1: Conn., Me., Mass., N. H., R. I., Vt.—Zone 2: N. J., N. Y., Pa.—Zone 3: Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4: Ill., Ind., Mich., Ohio, Wis.—Zone 5: Ala., Ky., Miss., Tenn.—Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7: Ark., La., Okla., Tex.—Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9: Cal., Ore., Wash.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Allis-Chalmers Manufacturing Co.—R. S. Stevenson was recently elected executive vice president.

Willard Storage Battery Co.—**J. P. Elliott** is now wholesale sales promotion manager.

Pacific Airmotive Corp.—**E. E. Adams** is now general quality control manager.

Minneapolis-Honeywell Regulator Co.—**James H. Binger** has been elected vice president.

United Aircraft Corp., Hamilton Standard Div.—**John P. Sullivan** and **John H. Spade** have been appointed to the operating committee.

Caldwell Industries, Inc.—**H. A. Martin** is now engineering and production director.

General Laboratory Associates, Inc.—**William J. Carry** has been elected president and a member of the board. **O. A. Thompson** was elected a director also.

Westinghouse Electric Corp.—**Charles F. Trapp** was named an area manager for the Detroit, Mich., branch office.

Cleveland Graphite Bronze Co.—**M. J. Merlin** was appointed Cleveland, O., factory manager, recently, and **Hugh S. Highet** was named chief manufacturing consultant.

Bull Dog Electric Products Co., Northern Div.—John E. Tomes has been named sales manager.

General Metals Corp., Adel Div.—**George Shy** has been named development engineer.

American Cyanamid Co.—**H. C. Little** was named assistant to the president, recently. **R. E. Sumner** and **C. F. Bonnet** have been chosen general manager and assistant general manager, respectively, of the Industrial Chemicals Div.

Kaynar Co., Aircraft Parts Div.—**Frank R. Lewis** is now sales manager.

U. S. Rubber Co., Footwear and General Products Div.—**Edmund G. Nagle** has become manager of automotive sales.

Daco Machine & Tool Co.—**Herbert Schwartz** has been promoted to production manager.

Crescent Co., Inc., Automotive Div.—Howard A. Utech has become field sales manager.

Goodyear Tire & Rubber Co., Films, Foam and Flooring Div.—**Joseph E. Mayl** has been named general manager of this new division.

General Motors Corp.—**Maurice A. Thorne** has been placed in charge of the Engineering Staff Vehicle Development Group, and **R. V. Hutchinson** and **G. C. R. Kuiper** will assist him. **John M. Campbell** is now assistant technical director on the general manager's staff of the Research Laboratories, while **Dr. Lloyd L. Withrow** heads the Organic Chemistry Dept.

Ford Motor Co.—**Stanley W. Ostrander** was recently elected vice president—Basic Products Group.

Joseph T. Ryerson & Son, Inc.—**J. S. Ure** has become general credit manager.

Illinois Tool Works—J. B. O'Conner is now vice president and manager of new product development.

Chrysler Corp., Airtemp Div.—**Richard J. Schumann** has been chosen vice president in charge of manufacturing of the Dayton, O., plant.

Piasecki Helicopter Corp.—**Hamilton W. Lord** has been named controller.

(*Turn to page 124, please*)

Necrology

Arnold W. Lenz, 64, general manager of the Pontiac Div., General Motors Corp., and vice-president of General Motors, died July 13, after an automobile accident in Flint, Mich.

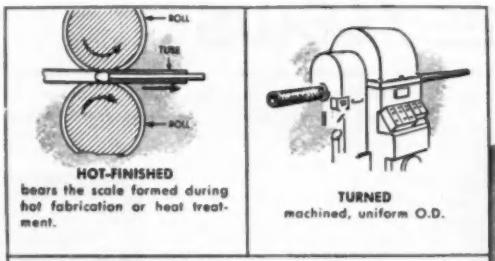
R. C. Brower, 60, secretary-treasurer and director of the Timken Roller Bearing Co., died at Melvin Village, N. H., July 13.

William G. Pearce, 93, retired chairman of the board of the American Brake Shoe Co., died July 15 in Falmouth, Mass.

Louis C. Huck, 56, president of the Huck Manufacturing Co. and inventor of the Huck automobile brake, died July 9, in Detroit, Mich.

Frank M. Hesse, 57, vice-president and treasurer of National Steel Corp., died in Pittsburgh, Pa., on July 10.

Charles C. Merz, 64, race driver and former chief steward of the Indianapolis Motor Speedway, and who was also the founder and former president of the Merz Engineering Co., died July 8, in Augusta, Ind.



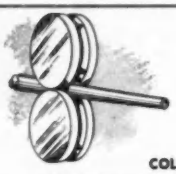
HOT-FINISHED
bears the scale formed during hot fabrication or heat treatment.

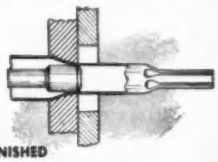
TURNED
machined, uniform O.D.

take a closer look at

YOUR

Finishing Time

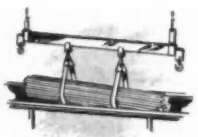




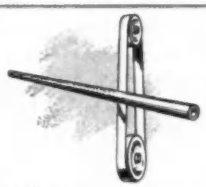
COLD FINISHED

ROTO-ROCKED
Smooth surfaces, obtained by special sizing and finishing processes.

COLD DRAWN
Smooth, scale-free surface.

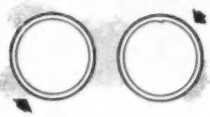


PICKLED
de-scaled by one of several solutions.



POLISHED
O.D. and/or I.D. polished to one of several specified degrees of smoothness.

FLASH-IN
ERW tubing which retains the bead formed by welding.



FLASH REMOVED
ERW tubing, bead-free.
Both available either as welded or normalized.

You aren't taking full advantage of the time savings and cost economies in the machining and fabrication of hollow parts from tubing *unless you start with tubing having the* **PROPER SURFACE FINISH.**

By specifying tubing having a surface finish keyed to your production methods, you take an important step toward reducing the time it takes you to make your finishing operations.

As a specialty tube mill, B&W supplies mechanical tubing in the variety of surface finishes illustrated.

Your choice should be influenced by your production facilities and consideration of the cost differentials among the several finishes.

In any case, remember that the tubing *you* can use is more than merely bar stock with a hole in it.

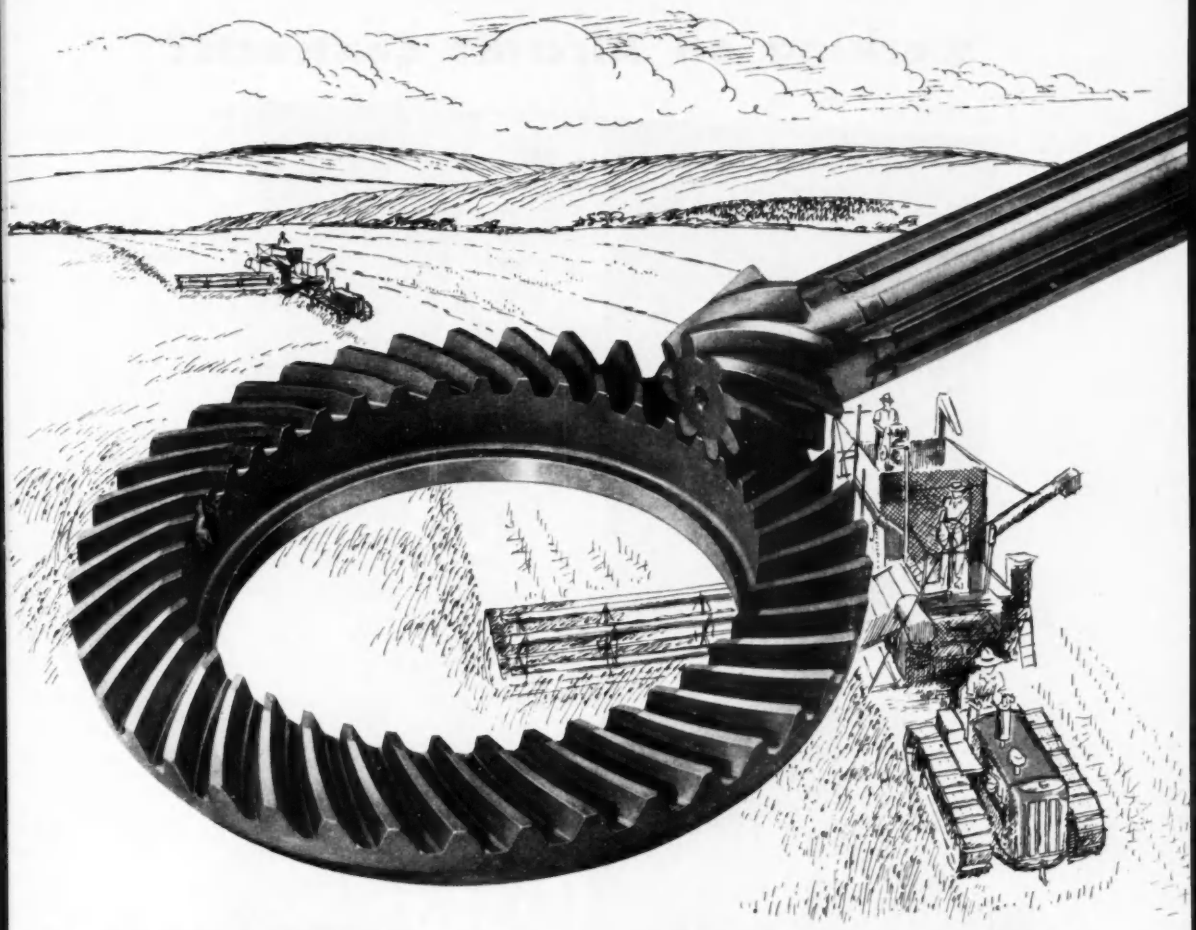
It can be delivered to you as a product ready for you to convert—in the shortest possible time and with least cost—into your finished product. Mr. Tubes—your B&W Tube Representative can help you select the tubing and finish most suitable for your specific end uses.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
General Offices & Plants
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. • Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19, Texas • Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 3, Okla.

B&W SEAMLESS and WELDED TUBES

TA-1690M



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GEARS for farm machinery are not necessarily a specialty with us. Our production includes gears for many other applications. But it is a fact that thousands of farm machines move into their all-important jobs with power transmitted by "Double Diamonds."

When you consider the beating that farm machinery takes, the industry's preference for "Double Diamond" Gears speaks highly of their stamina and all-round performance. It may suggest, as well, the advisability of calling in a "Double Diamond" engineer the next time you need gears of the many types we manufacture.

DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

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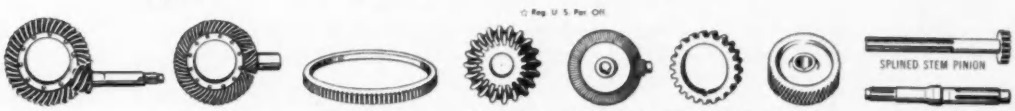

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Be sure to send for your copy. Write 3M, Dept. 108 411 Piquette Avenue, Detroit 2, Michigan . . . . . .

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MINNESOTA MINING AND MANUFACTURING COMPANY • ADHESIVES AND COATINGS DIVISION

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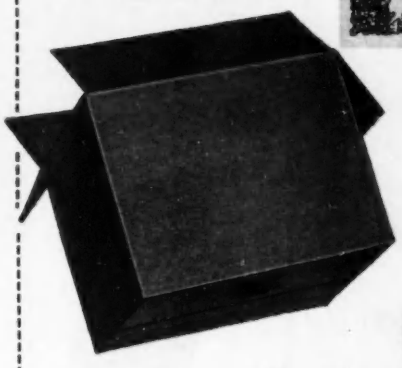
A Pedigree is a Promise of Quality . . .

IN BOXES TOO!



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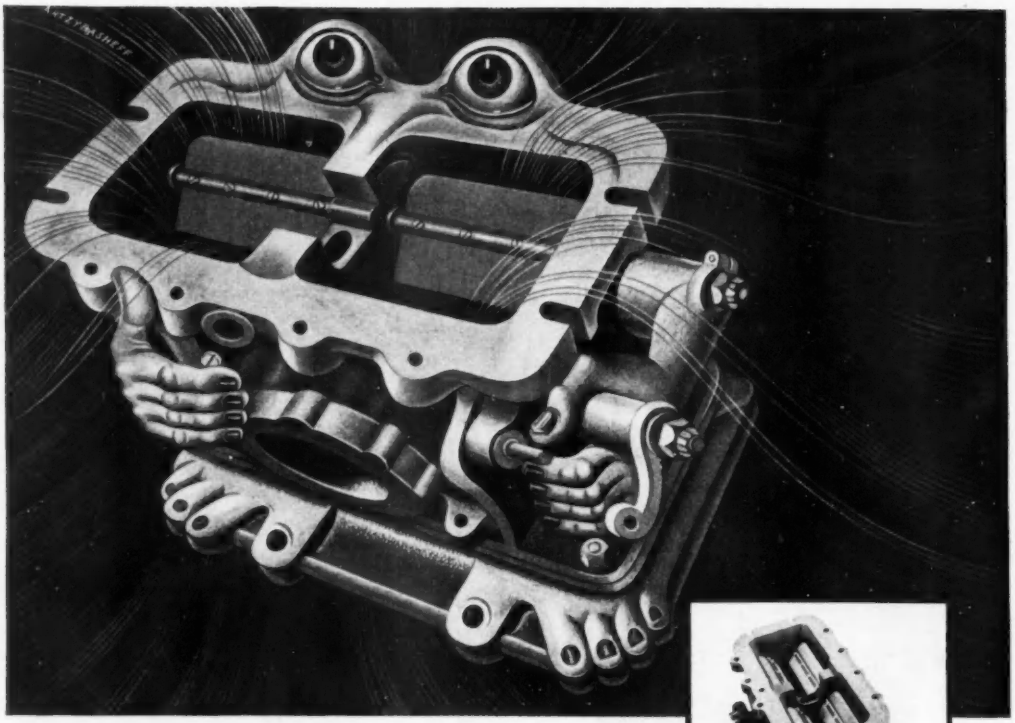

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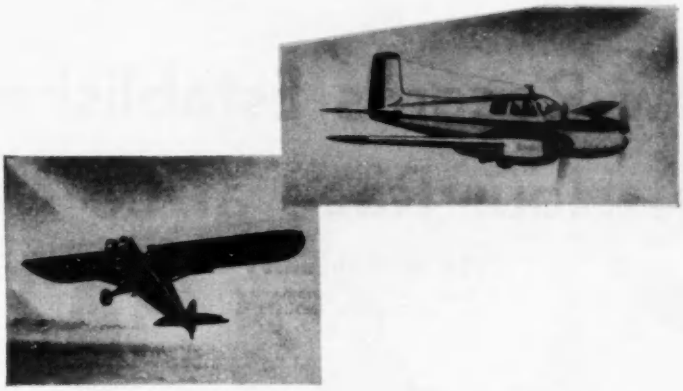

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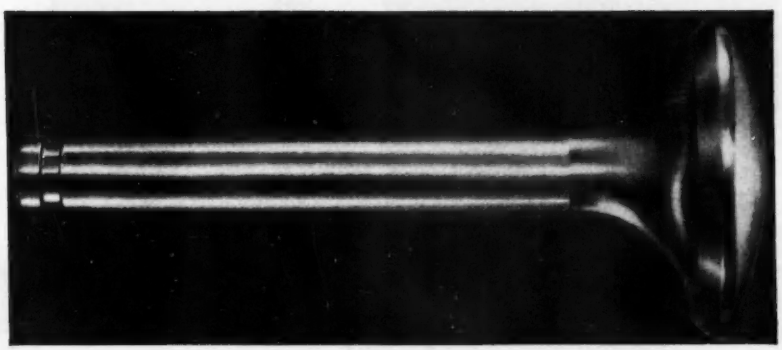


New Records Established in 24-Hour Race at Le Mans

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

LE MANS, FRANCE

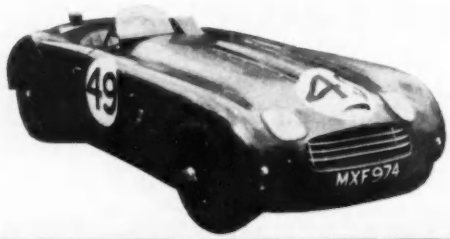
THAT sports cars carrying full equipment are capable of sustained speeds of almost 100 mph was proved in the annual 24-hour road race at Le Mans, France, when the distance during two rounds of the clock was boosted by 76 miles to a total of 2320 miles, giving an average of 96.66 mph. The winner was a new type Mercedes-Benz with a six cylinder engine of 183 cu in. piston displacement, handled by Lang and Riess. A similar Mercedes came in second place with a distance of 2312 miles. The American-British combination Nash-Healey got into third place with a distance of 2196 miles, average 91.5 mph. This car had a Nash engine of 252 cu in. Briggs S. Cunningham worked his car into fourth place with a distance of 2116 miles, average 88 mph. This was the only all-American among the 17 cars running at the end.

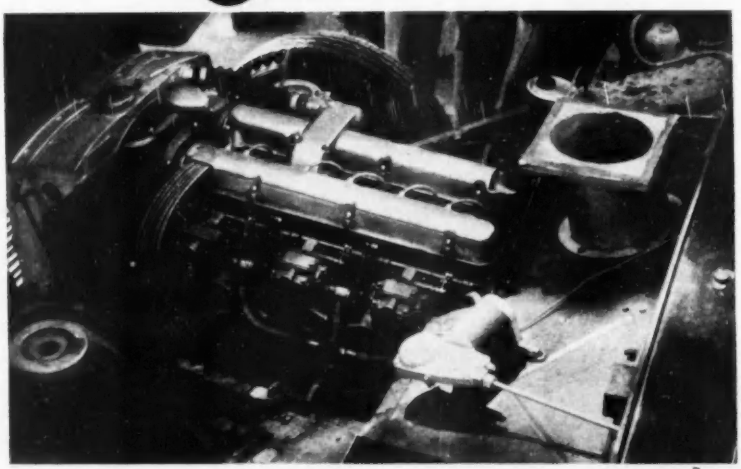
This year the 60 competitors comprised Cunningham from America, Nash-Healey and Allard-Chrysler as British-U. S. A. combinations, Mercedes and Porsche from Germany; Ferrari, Fiat, Alfa-Romeo, Osca, Lancia from Italy; Jaguar, Jowett, Frazer Nash, Aston Martin, from England; Renault, Panhard, Talbot, Gordini, Simca and Peugeot representing France, and Pegaso from Spain.

Competition was higher than ever before, the pace was faster from the outset, and mechanical failures were high, for 42 cars were forced out during the 24 hours. Briggs S. Cunningham made a strong attempt to win and presented three of

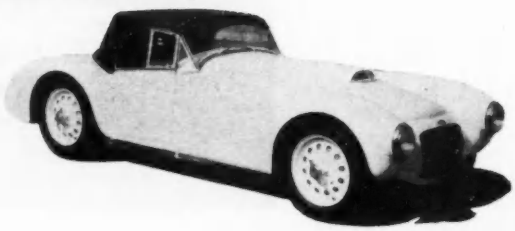
(*Turn to page* 86)

This British Allard is powered by a Chrysler Fire Power engine.

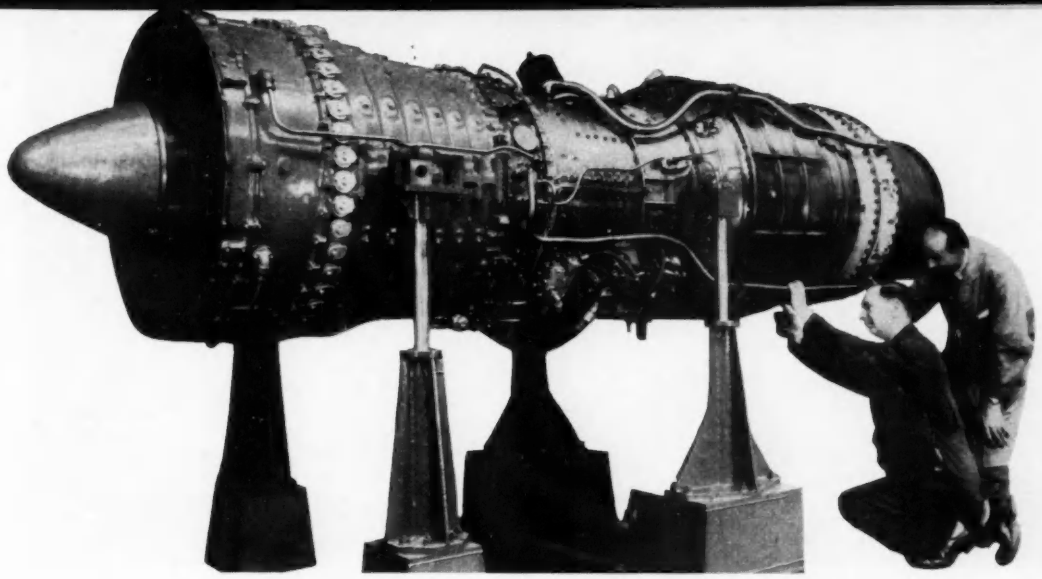




Above—Mercedes-Benz 183 cu in., overhead-valve, six cylinder engine. It develops 173 hp at 5200 rpm.



Right—Frazer Nash which has a Bristol-built 122 cu in. engine with an output of 125 hp at 5500 rpm.



Left side view of the new Bristol Olympus showing general design and arrangement of accessories.

New Jet Delivers Thrust of 9750 Lb

CONDENSED SPECIFICATIONS OF THE BRISTOL OLYMPUS

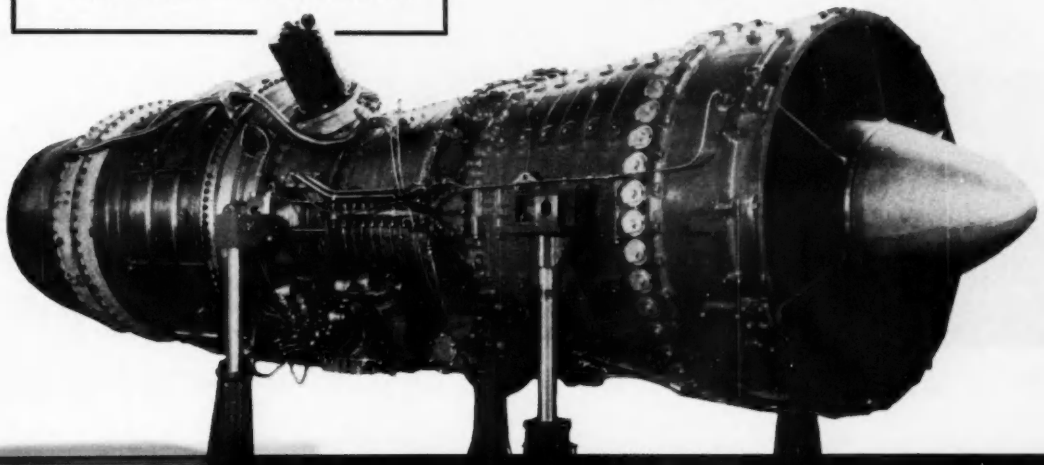
Diameter	40 in.
Length, intake flange to exhaust flange	124 in.
Weight	3520 lb
Maximum thrust	9750 lb
Consumption (lb/lb thrust/hr)	0.766

DETAILS of the Bristol Olympus turbo-jet, released for the first time, reveal that the Bristol Aeroplane Co., Ltd., England, has established a new mark in aviation history, an aircraft engine which delivers 9750 lb thrust.

This new jet is the first of what is known as the two-spool type. High compression ratio is obtained from axial compressors by compounding. The Olympus has two compressors in series—a low pressure unit and a high pressure unit—each having an entirely independent compressor and turbine. The low pressure unit acts as a supercharger to the high pressure compressor, and each is driven through concentric shafts by its own separate turbine.

This arrangement is claimed to give all the advantages of handling and easy starting obtained with engines of medium compression ratios, and to yield the much lower fuel consumption made possible by the use of high compression ratios.

Right side view of the Bristol Olympus.



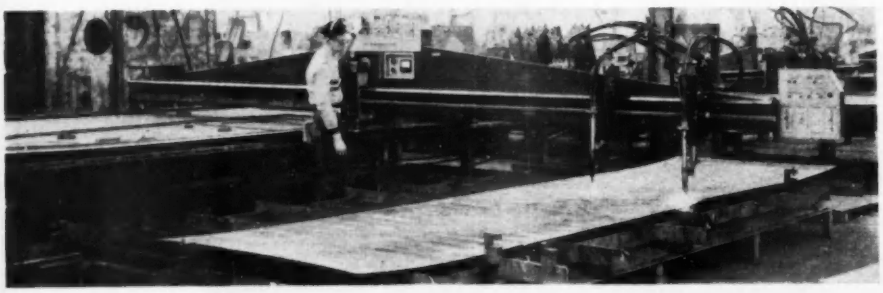
Some impression of the size of Caterpillar earthmoving equipment built at Joliet may be gained by this view of the new No. 90 Scraper. With a shipping weight of 35,100 lb, this machine is 10 ft 6 in. high, almost 40 ft long, and 12 ft wide.

Materials Handling a Major Problem in Making Earthmoving Equipment

THE recently-opened Caterpillar Tractor Co. plant in Joliet, Ill., currently comprising a floor space of some 700,000 sq ft under roof, represents a new approach in the production of heavy earthmoving equipment. It has been designed specifically for the manufacture of scrapers, wagons, bulldozers, rippers, as well as cable controls and hydraulic control units.

Even while initial production is being established, the company is planning an extension of some 230,400 sq ft, as well as the erection of a 280,000 sq ft parts building.

As will be evident from the illustrations, this plant is concerned with the fabrication of out-sized and heavy equipment which poses a major problem in materials handling. Because of the size, shape, and weight of individual elements, materials handling has been developed through the installation of a network of 619 hoists and cranes, requiring more than six



A number of the latest type tracer-controlled torch cutting machines supplied by the National Cylinder Gas Co. are used for cutting steel sheet and plate. A four-torch machine of the same type is employed for cutting smaller parts from heavy plate stock.

By Joseph Geschelin

Industrial trucks also deliver these huge —93 in. diameter—tires to the scraper assembly line.

miles of monorail for serving these various hoists.

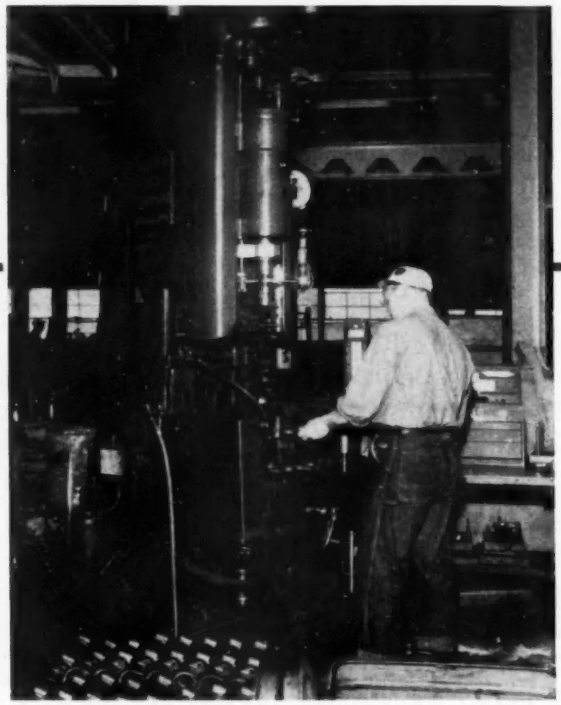
In addition, there are special floor type conveyor systems for assembly and sub-assembly, and Mathews gravity roller conveyors for linking certain operations. This operation does not lend itself to the use of monorail conveyors except for sheet metal painting, hydraulic testing, and certain other special operations.

As will be noted later, a large fleet of Yale & Towne industrial trucks of various types is employed for hauling and other special tasks.

The plant boasts four heavy duty assembly lines—one each for bulldozers, scrapers, wagons and rippers, and two lines for controls.

At the present time the plant has 829 machine tools and items of welding equipment, as well as a large

This view of one of the giant welding fixtures for welding the scraper bowl will give some impression of the nature of the fabrication job at Joliet. It is a full 360-deg rollover fixture, designed to facilitate the tack-welding of the bowl and permitting finish-welding in a flat position at all points.



Precision type machine tools, such as are commonly found in automotive plants, are installed in the department for machining hydraulic control parts. Here is a Micromatic hone for finishing valve body bores to close tolerances.

variety of welding positioners, some exceeding in size the positioners used in welding tank hulls. Arc welding is employed extensively in the fabrication process, 1934 ft of welding rod being consumed in the fabrication of a single large scraper bowl. Another interesting statistic is that more than 6000 gal of paint is consumed each month in painting parts and assemblies.

Typical of the operations required in the fabrication of the various earthmoving machines is the following outline covering a large scraper:

1. Sheet steel and plates up to 106 by 240 in. are transported to the fabricating shop.

2. Piece parts then are cut from these plates by oxy-acetylene torch as well as the special National Cylinder Gas oxy-acetylene tracer type machines illustrated here.

3. Component parts are formed over press brakes and punch presses, ranging in size from 100-ton to the two big hydraulic presses—a 2500-ton HPM, and a 2000-ton Lake Erie.

4. All parts then are transported to the welding areas where they are assembled into sub-assemblies and arc welded.

5. Next they go to final assembly stations for final assembly and finish arc welding.

6. Welds then are cleaned by means of hand grinders, weld chippers and wire brushes.

7. The scraper is transported to the assembly conveyor where component parts such as wheels, aprons, ejectors, draft frames, cables and sheaves are added.

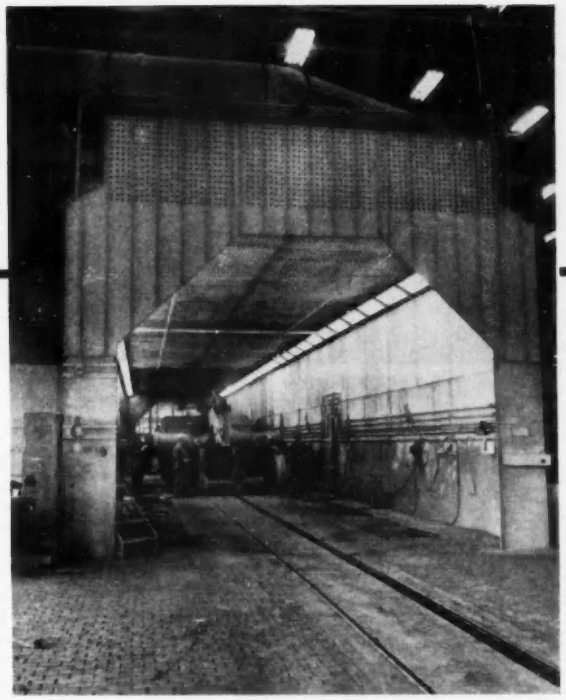
8. Next stage is at the test floor where all linkage and moving parts are checked for alignment and clearance.

9. Finished scrapers then are transported through the enormous R. C. Mahon paint booth, on a floor conveyor, for washing, steaming, priming, and finish paint.

Materials handling is a major function in the production economy of this plant. Small parts, handled in bin loads, are transported by means of battery-powered Yale & Towne Worksavers. Large shipments such as steel plate and bulk coal are handled in the yard by means of a Browning locomotive crane, powered by a Caterpillar D13000 engine. Five large overhead cranes handle such loads as the No. 90 Scraper which has a shipping weight of 35,100 lb.

Fork trucks work in assigned areas while regularly scheduled trailer trains handle intraplant freight up to loads such as bulldozer blades, the largest of which is over 10 ft in length. Martin Carryall trailers transport scrapers and wagon bodies to the storage yard or to the assembly line.

Scrapers, wagons, and rippers travel on moving dollies for assembling and painting. Upon completion of assembly, these units are moved by a special Caterpillar D4 tractor equipped with cable controls, hydraulic control, and a C-frame for lifting.



Finish-painting of complete assemblies is handled in this enormous R. C. Mahon tunnel type paint spray booth. Overspray is drawn by the air circulation system through gratings in the floor.

Below is a glimpse of the power-driven floor conveyor for the assembly of scrapers. The D4 Caterpillar tractor at the left is used for testing completed units.

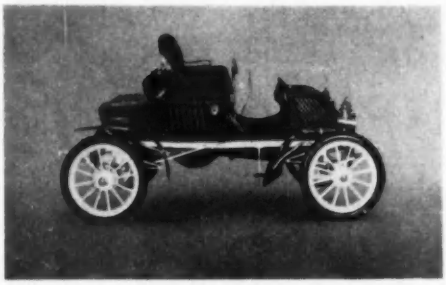
The following is a list of major items of materials handling equipment used here:

25 Yale & Towne Worksavers
1 Yale & Towne Worksaver stacker
20 Yale & Towne fork trucks
4 Yale & Towne boom trucks
3 Clark tow tractors
30 Yale & Towne knuckle-steer trailers
3 Martin heavy equipment trailers
4 Caterpillar Diesel tractors
1 Browning locomotive crane
1 Lorain rubber-tired crane
5 P & H overhead cranes
25 Lewis-Shepard hand jacks
1 Ford stake truck, 1½ ton
2 Ford dump trucks, 1½ ton
551 Floor operated cranes and hoists

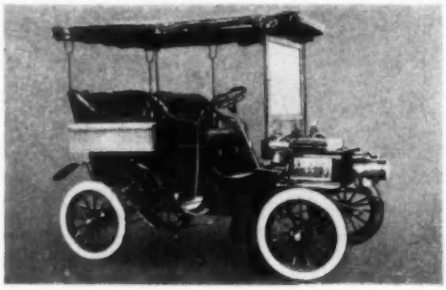
The overhead materials handling system, roughly six miles long, includes 200 hand propelled two-runway cranes, 25 motor-propelled two-runway cranes, 15 motor-propelled single-leg gantry cranes, 200 hand-propelled electric hoist carriers, and 40 motor-propelled electric hoist carriers.

This extensive overhead system, supplied by Cleveland Tramrail, incorporates the unusual feature of motor propelled, floor controlled cranes on runways extending the entire length of the 920-ft bays.

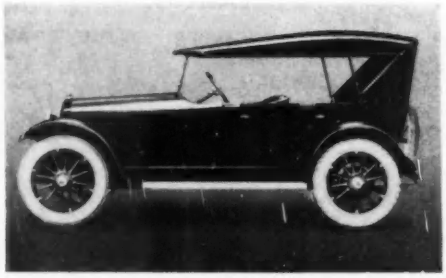
Highlights of NASH'S *Half Century*



1902 Rambler



1904 Rambler



1918 Nash

1902—Thomas B. Jeffery, whose company later became Nash Motors, began production of Rambler automobiles in Kenosha, Wis. Jeffery Co. built 1500 Ramblers, and the company became the world's second mass-producer of automobiles.

1905—The Jeffery Co. was the first to introduce a spare wheel as optional equipment on its Rambler models.

1914—The Rambler name was changed to "Jeffery" in memory of its founder, Thomas B. Jeffery, who died in 1910.

1916—Charles W. Nash resigned as president of General Motors to purchase the Thomas B. Jeffery Co. and founded Nash Motors Co. Jeffery production was continued, bearing the Nash nameplate.

WW I—In the fall of 1917, the 1918 Nash was introduced. It was the first Nash-designed car. Some 10,000 cars were sold in the first full year of production. Nash Motors produced more than 11,000 trucks in 1918—a record said to be unequalled by any other manufacturer prior to that time. Most trucks were the Quad, of World War I.

1919—Nash Motors purchased a half interest in the Seaman Body Corp. The other 50 per cent was purchased in 1936.

1922—Nash introduced the first rubber-mounted engines.

1924—Nash organized the trade name and equipment of the LaFayette Motor Car Co.

1949 Nash 600

1941 Nash 600

1938 LaFayette

This is how the assembly lines looked when Jeffery cars were being produced at the rate of 124 per month during 1902, the company's first year of operation.

1934—Nash produced its millionth automobile, and began production of a low-priced LaFayette model.

1936—Stockholders of Nash Motors Co. and Kelvinator Corp. approved the merger of the two companies. Charles W. Nash was named chairman of the board, and George W. Mason, president, of Nash-Kelvinator Corp.

1940—The new Nash "600" came off the production line. It was built on a new principle, known as "Airflyte" body and frame construction.

WW II—During World War II, Nash-Kelvinator Corp. built more than $600,000,000 worth of aircraft material, including engines, propellers and helicopters.

1946—Nash car sales totaled 4.69 per cent of the industry—highest in the company's history.

1948—Charles W. Nash died on June 6. He was succeeded on the board of Nash-Kelvinator Corp. by George W. Mason, who also continued as president. The firm brought out a newly styled postwar car. A new assembly plant was opened in California.

1950—Nash revived the Rambler name. In April, the convertible model was introduced, followed a few months later by the Rambler station wagon. During this year, Nash brought out an experimental car, the NXI—now called the NKI.

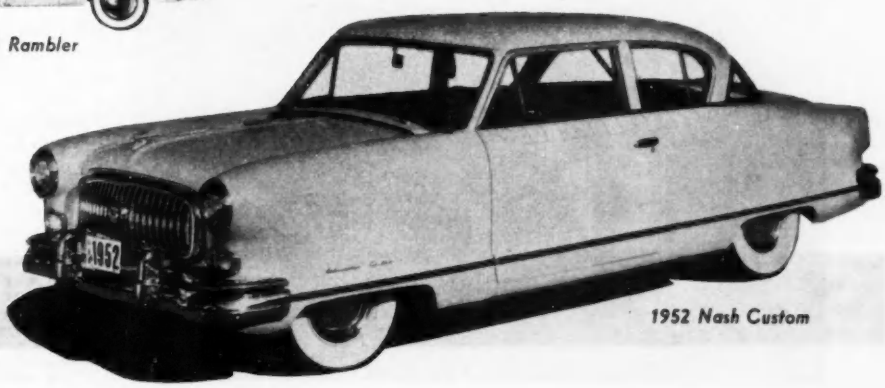
1951—In July, the company introduced the third in the Rambler series, the Country Club hardtop convertible. A high powered sports car, called the Nash-Healey, was developed and placed in limited production.

1952—New Nash automobiles were designed with a European flair by Pinin Farina, the well known Italian custom car designer.

1951 Nash-Healey

1950 Nash NXI

1950 Rambler



1952 Nash Custom

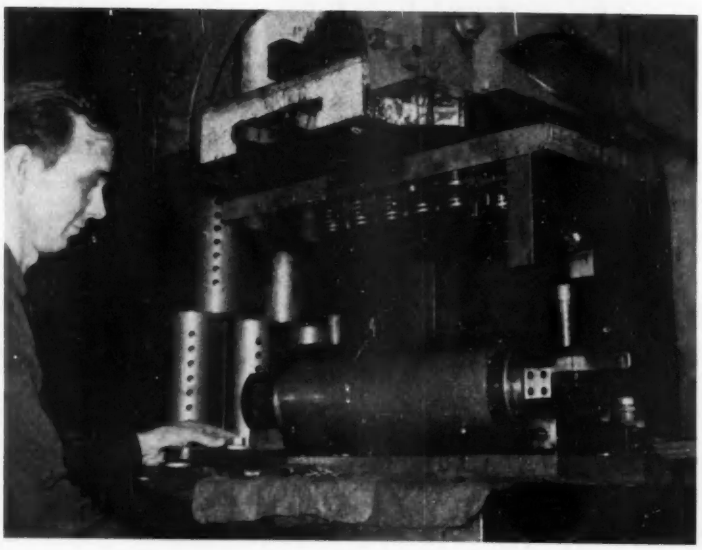
Jet Engine

Outer combustion chambers are fabricated from stainless steels and seam welded with machines which make a series of overlapping spot welds to form gas-tight seams

PRODUCTION lines at Ryan Aeronautical Co., San Diego, Calif., have been streamlined to fabricate thousands of inner and outer combustion chambers, and transition liners for General Electric J-47 jet engines. These components are precision-made to withstand extreme temperatures and high-velocity gas flow.

Inner combustion chambers are made from Inconel — a tough, heat-resistant chrome-nickel alloy. The sheets are blanked and pierced in precision dies by huge presses. They are rolled into circular form and welded along their seams with automatic heliarc machines. Punch presses cut out the holes and louvers which permit just the right amount of air to enter and mix with the burning fuel.

The chamber, cap and exit shell are aligned and automatically spot-tacked together in a spe-



Intricate pattern of holes and louvers is made in each Inconel inner combustion chamber by punch presses which exert up to 105 tons at each impact. Design of these openings is important to jet engine performance because proper air mixture is influenced by number, shape and location of apertures.

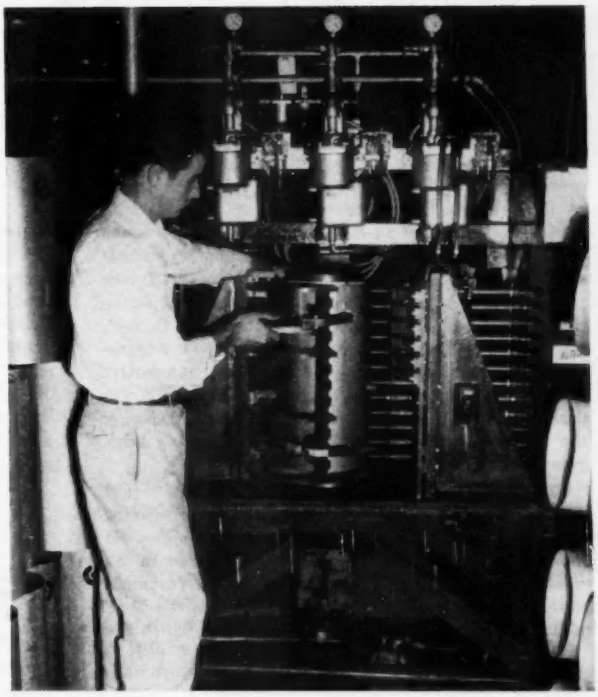
Combustion Chambers Made to Close Tolerances

cially designed welding machine. Seams are closed with fast, seam-welding machines; fittings are spot welded on, and the assembly is ready for a series of minute inspections.

The inner combustion chambers are inserted into outer combustion chambers which are hermetically sealed tubes of stainless steel. Ryan builds these structures in similar fashion to the methods used for inner chambers. A water-alcohol mixture is injected into the combustion area to provide boosts in thrust output for limited intervals which increases the mass flow and the exhaust velocity.

The function of the outer combustion chamber is to direct tremendous quantities of compressed air into the inner chamber, for combustion and expansion, and to act as a cooling shroud for the inner chamber. This cooling effect is attained by a sheet of air which flows between the inner and outer chambers. The combustion unit is designed to start the burning of the fuel at the front end of the inner chamber and to complete this combustion before the gases reach the rear.

Because the inner and outer combustion chambers must fit together in perfect alignment, close control of the dimensions of these components is a vital requirement of their fabrication. When the inner chamber is inserted into the outer shell, the maximum allowable clearance between the two, at the flange ring, is held to the smallest practical limits. Rigid demands for concentricity and roundness must be met. First, the faces of the front and rear flanges of the outer chamber must be flat and parallel within minute tolerances. Then, while meeting these requirements, the flanges must be concentric with the inner chamber. These are extremely close tolerances to meet in welded sheet metal structures.



Outer combustion chambers are aligned and spot welded in a new machine, designed by Ryan, which makes 12 spot welds simultaneously.

Wide variations must be accommodated due to extremely high operating temperatures of the inner combustion chambers. Provision for thermal expansion of the inner chamber is made by suspending them from the fuel nozzle entry and allowing them to join the transition liners, at the rear, by means of a slip-fit connection. This arrangement gives them a floating suspension inside of the outer chambers and permits them to increase in length and diameter without resistance. Outer combustion chambers are fitted with a stainless steel bellows at the rear end, which provides them with a flexible joint for thermal expansion and to facilitate assembly.

Great Fuel Savings Possible With Ideal Engine-Transmission

By D. F. Caris and R. A. Richardson
Research Laboratories Division, General Motors Corp.

JUST as there are many future gains in efficiency possible by increasing compression ratios of engines, there are many gains in economy possible by developments in transmissions to most effectively utilize the potentials of the engine. The aim of this article is to show the large incentive to fit the transmission to the engine better and vice-versa. It is realized that the problem is as broad as it is long. There are many engine variables and an equal number of transmission variables. The large gains in economy possible through the use of high compression engines with new transmissions, give engineers a very important incentive to continue developments in both fields. In fact, the authors believe that a combination power-transmission system will be the next step in automotive development. The combined engine-transmission power package is the most fundamental development facing the industry today, and this article shows the large gains in economy which it can make possible.

Figure 1 shows the relationship between brake specific fuel and brake horsepower at the constant speed of 2000 rpm for the GM Research engine. It shows how the specific fuel consumption varies in the cross section between road load and performance power. This curve is obtained by leaning the A/F mixture from point A, the mixture ratio at which the engine develops maximum power, to B where it develops best economy. The throttle is closed from wide open at B to the throttle opening required to develop road load horsepower at C. The specific fuel consumption at point B is obviously only a fraction of that at point C. In fact, at the minimum specific fuel consumption which occurs at 70 bhp, the specific fuel is only 0.43 lb/bhp/hr, in comparison with the road load point C, 13 bhp, where the specific fuel consumption is 0.97 lb/bhp/hr.

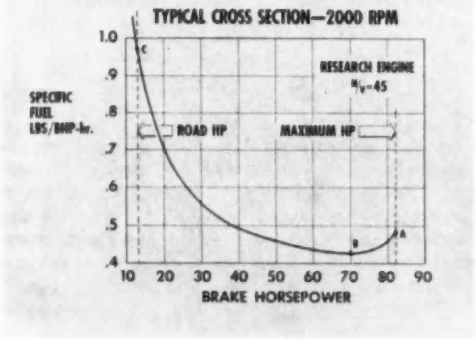


Fig. 1

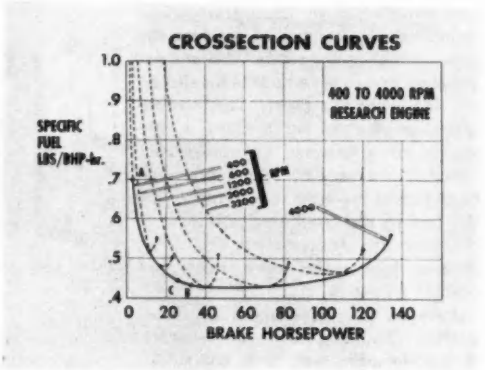


Fig. 2

Superimposed in Fig. 2 is a whole family of individual cross section curves. It shows the relationship between specific fuel consumption (lb/bhp/hr) and brake horsepower under a wide variety of operating conditions for the 253 cubic inch Research engine.

When enough of the individual cross section curves are included, the whole group can be enclosed by an enveloping curve. Under the operating conditions represented by any point on this curve, the engine will develop its best economy. It is apparent, therefore, that if the ideal transmission is to deliver best economy, it should permit the engine to operate on this curve at all times. In other words, the transmission controls should always adjust the engine setting to operate at the point of minimum specific fuel consumption.

In order to illustrate the method of arriving at the engine-transmission relationship for best economy, the following typical conditions will be discussed:

1. Minimum engine speed.
2. Typical point of minimum specific fuel consumption.
3. Typical performance calculation.
4. Engine limited to speed of maximum horsepower.

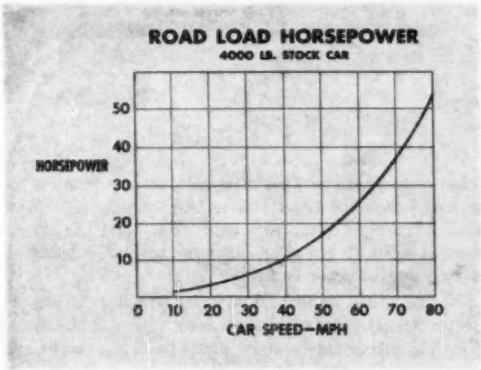


Fig. 3

First, the power required to drive the car at various speeds is computed. For this the following formula is used:

$$HP = \frac{(KW - K_1AV^2)\ V}{375}$$

where $K = 0.012$

$K_1 = 0.00125$

W = test weight (car weight + 600 lb test weight)

A = projected frontal area, sq ft

V = car velocity, mph

In this analysis a stock car having $W = 4000$ lb is used.

Figure 3 shows such a road load power requirement curve for a standard stock car. It can be noted from the figure that it required 3.2 bhp to drive the vehicle at 20 mph on a level road. Referring again to Fig. 2, it can be seen that 3.2 bhp is developed at point A on the curve of best economy. At this point the engine uses fuel at the rate of 0.70 lb/bhp/hr, from which the mpg can be computed from the relation:

$$MPG = \frac{N \times C}{F \times P}$$

where N = miles per hour

C = lb/gal of gasoline

F = specific fuel consumption, lb/bhp/hr

P = horsepower

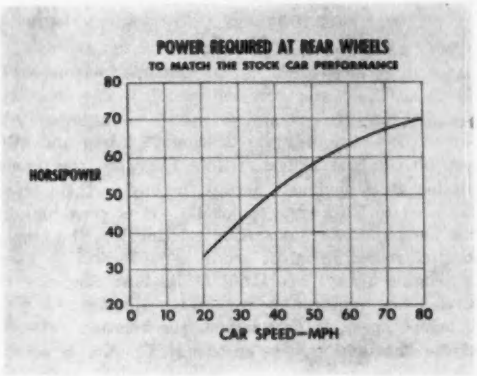


Fig. 4

Arbitrarily, the minimum speed of the engines used in these studies was limited to 400 rpm, which accounts for the relatively high fuel consumption at point A. The engine has to be throttled considerably in order to develop 3.2 bhp at 400 rpm. An engine having less displacement would, of course, operate more efficiently at this road load. The effect of engine size will be discussed later in the article.

The second typical condition illustrates the point of minimum specific fuel consumption. From the road load power curve, note that at 60 mph it requires 26 bhp to drive the car on a level road. Fig. 2 shows that at 26 bhp, point C, on the curve of best economy, the engine uses fuel at the rate of 0.445 lb/bhp/hr, as compared to 0.70 lb/bhp/hr at 20 mph where the 400 rpm minimum speed limitation made it necessary to close the throttle to meet road load horsepower requirements. At level road driving, the transmission would operate the engine on the solid, minimum specific fuel envelope curve.

The third typical condition which must be considered is the required performance, represented by acceleration and hill climb in the car, and by horsepower available for these factors to the engineer. In this example, operating conditions were selected to match the performance of the standard 4000-lb stock car (Fig. 4), which requires 30.2 bhp at 20 mph in addition to the 3.2 required for road load, or a total

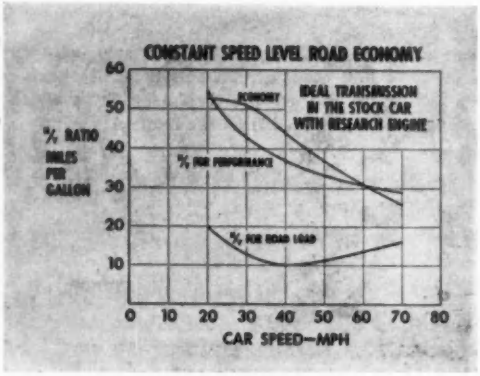


Fig. 5

bhp of 33.4. In order to develop 33.4 bhp and still keep on the best economy curve (Fig. 2), the transmission must obviously permit the engine to increase its speed to 1100 rpm (point B). It is seen that in this ideal engine-transmission relationship, the transmission should in effect act as a moderator to keep the engine always operating at its best efficiency to develop the required power. Once the desired performance speed is determined, the relation between engine rpm and vehicle speed (N/V) can be established. The transmission controls would pick the engine speed to develop the required horsepower at a point of minimum fuel consumption. This is again on the solid envelope curve.

Figure 5 shows the level road, constant speed fuel economy over the speed range from 20 to 70 mph resulting from the above ideal engine-transmission relationship, assuming no losses between the engine and road. Also shown is the road load ratio of engine rpm to car speed (N/V) and the N/V to give the stock car performance over the speed range. For instance, at 40 mph the road load N/V is 10 and performance N/V is 37. It is recognized, of course, that much higher N/V ratios are required to start the car from rest.

Fuel economy figures such as those shown in Fig. 5 are difficult to evaluate unless they can be compared with a familiar yardstick. Fig. 6 compares level road, constant speed fuel economy with the two types of transmissions, the ideal and fixed N/V in the stock car equipped with the Research 253 cu in. engine. The curves were computed without considering loss in efficiency between engine and road in either case. The data are presented on a comparative basis, and it is felt that from the engine man's standpoint it is fair to ignore transmission losses in this study since they vary with the mechanism used to obtain the results. Moreover, since this study does not propose a transmission design, the actual losses are unknown. The figure shows that the use of the ideal transmission would make possible gains in constant speed fuel economy of from 70 to 48 per cent over the speed range

Great Fuel Savings Possible

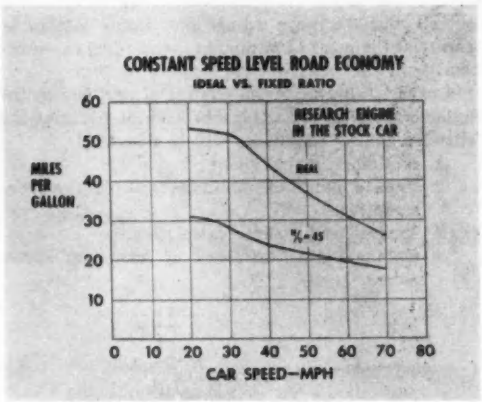


Fig. 6

from 30 to 70 mph. This analysis presents what is inherently possible from the engine standpoint. How much of this is obtained will depend upon the transmission design; but even allowing for large losses, a large potential gain remains.

On the other hand, automobiles are not driven on level roads at constant speeds very much of the time. Fig. 7 is presented to show how operating conditions affect the gains in economy realized from the use of the ideal transmission. Two curves are shown in the lower half of Fig. 7 illustrating the relation between specific fuel consumption and brake horsepower for the experimental 253 cu in. engine in the stock car at 40 mph. The ideal transmission permits the engine to follow the best economy curve, whereas the standard transmission with fixed N/V ratio of 45 forces the engine to follow the other curve. The stock car requires 10.5 bhp to propel it at 40 mph on a level road. On the best economy curve at point A, 10.5 bhp can be developed at 400 rpm with fuel consumption of 0.518 lb/bhp/hr, while it requires 1.02 lb/bhp/hr to develop the same 10.5 bhp at 1800 rpm (point B) on the fixed N/V curve. Now, point B is equal to 22.4 mpg and point A corresponds to 44 mpg as plotted on the upper set of curves. It is apparent that under these conditions it is possible to almost double the mpg if an ideal transmission were possible.

The curves of Fig. 7 also show that, as the throttle is opened with the standard or fixed N/V transmission to develop more horsepower for performance, the fuel consumption is rapidly reduced until at C, with the

throttle open, it exactly equals the fuel consumption with the ideal transmission. At E, corresponding to 70.5 bhp required for full performance at 40 mph, the standard transmission has required the engine to cut in the richer A/F power mixture, while the ideal transmission has permitted it to increase the speed to 2000 rpm and develop the 70.5 bhp without enrichening (point D).

This ability of the ideal transmission to let the engine operate in the lower speed range without enrichening, results in from 10 to 15 per cent improvement in economy over present transmissions whenever the engine is operated at full throttle. At the higher

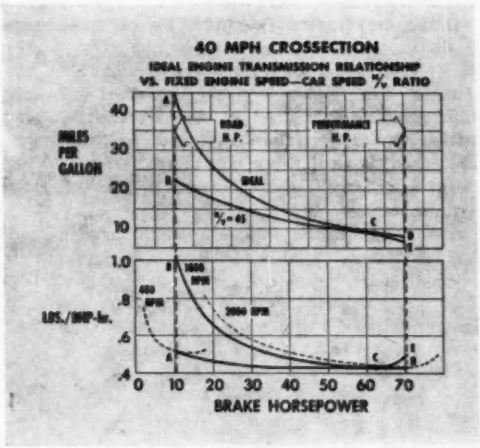


Fig. 7

car speeds it would, of course, be necessary to enrichen the A/F mixture in order to obtain performance and top speed.

The ideal transmission will obviously limit the top speed of the engine to the point at which it develops maximum power. In some cases this would result in lower specific fuel consumption and slightly higher top speed.

Analysis of Fig. 7 discloses several important facts about the gains in economy with the ideal as compared to the standard transmission. These are the factors which will be important in the combination power-transmission system:

1. The greatest improvement in economy occurs at road load, around 98 per cent in this case.

2. The improvement in economy rapidly decreases at greater loads.

3. Since the driver is continually operating between road and performance power, his overall gain in tank mileage will obviously be much less than the 98 per cent he obtained under constant speed, level road conditions.

4. The effect of country and city types of driving on economy will be greater with the ideal transmission. However, use of the ideal transmission will always result in an improvement in economy under all conditions. This fact represents an important advantage, since a large percentage of fuel is used in city driving.

5. With the ideal transmission, road load economy is independent of performance, while with the standard transmission the greater the performance, in general, the lower the road load economy.

6. The higher the performance factor, the greater the economy gains resulting from the ideal engine-transmission relationship.

In the foreging discussion, an experimental Research engine was used to illustrate the gains to be obtained by use of the ideal transmission. It might be interesting to apply the same engine-transmission relation-

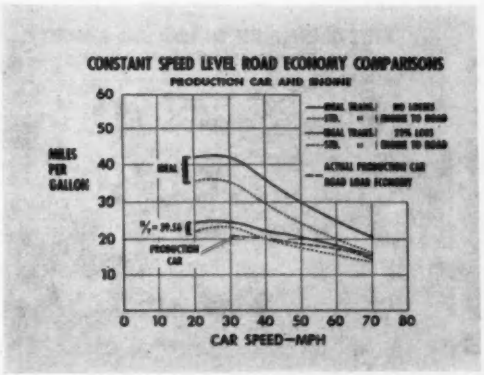


Fig. 8

Great Fuel Savings *(Continued)*

ship to a standard production car and engine. The curves in Fig. 8, represented by solid lines, show level road, constant speed economy of the standard car compared to the same car with the ideal transmission. Both curves were computed by assuming no losses between the engine and the road. It is apparent that improvements of 70 to 30 per cent are possible in road load economy over the speed range from 30 to 70 mph with the ideal engine-transmission power package.

In computing the dotted curves shown by Fig. 8 a 20 per cent loss in efficiency was arbitrarily assumed between engine and road. It can be seen that the actual values of mpg have been reduced in both cases; but even under these conditions, a 60 to 18 per cent improvement in economy is shown.

Figure 8 also shows the actual measured level road, constant speed economy of the standard car for comparison. Again, it must be emphasized that cars are not driven at constant speed on level roads and that the improvement in overall tank economy, while substantial, is not likely to be nearly as great with the ideal transmission as is indicated by these constant speed economy curves.

The effect of engine displacement on road load economy is shown by Fig. 9. Three engines having compression ratios of approximately 8:1 and the following displacements were used for this study: (1) 162 cu in., (2) 253 cu in., (3) 287 cu in.

The curves show a considerable advantage in level road fuel economy for the small engine. The reason the small engine has an advantage in the low speed range is because internal combustion engines are not very stable at very low rpm, and engine speed has been arbitrarily limited to 400 rpm for the investigation covered in this paper. It requires six bhp to propel the stock car at 30 mph on a level road. At 400 rpm the 162 cu in. engine, to develop six bhp, can operate almost at its best economy point while the 253 cu in. engine must operate at a much poorer load factor to develop the same horsepower. Obviously, the 287 cu in. engine must be throttled still further to develop the required six bhp at 400 rpm. It can be seen that the difference in economy between the three engine sizes diminishes gradually to 70 mph, at which point they are all about the same.

Before drawing any conclusions from Fig. 9, examine Fig. 10 and see what effect engine size may have on some of the critical transmission requirements. Fig. 10 shows the road load relation between engine and car speed (N/V) to obtain best economy. It also shows N/V ratios required to equal the stock car acceleration rates. It can be seen that the small engine requires a larger change in N/V ratio from road load to performance than the larger engines do. The small engine would also limit the top speed of this car.

In spite of the fact that the 162 cu in. engine gives appreciably better level road economy in combination with the ideal transmission in the low car speed range, this advantage appears to be more than offset by other limitations such as lower top speed, high N/V ratio changes, noise, and other factors involved with small high speed engines. As is the case in most automotive applications, the selection of an ideal engine size for a particular car and transmission will represent a compromise based on experience with actual equipment.

It has been shown in the foregoing analysis that very substantial improvements in economy can be accomplished by an ideal engine-transmission relationship. The authors believe that future gains in economy will come through development of the concept

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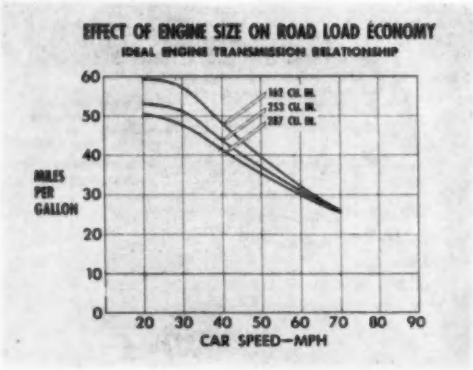


Fig. 9

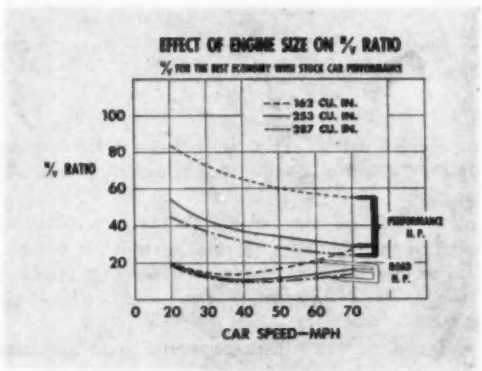


Fig. 10

Windless Wind Tunnel

This electronic analog computer, designed and built at Northrop, is the brain of the new flight simulation device.

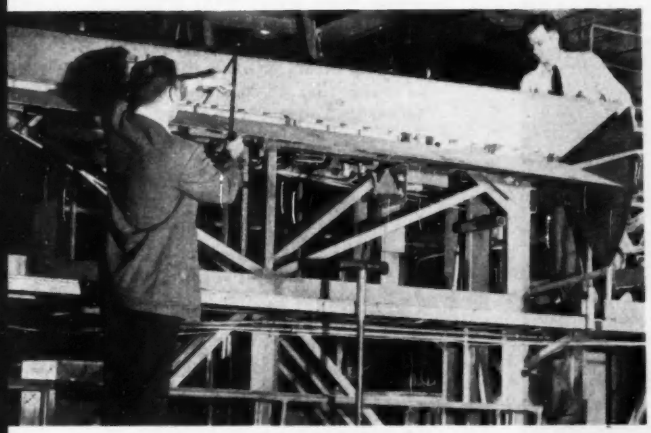
A "WINDLESS wind tunnel" that uses electronics instead of air at high speeds to simulate flight tests of the U. S. Air Force's Northrop Scorpion F-89 all-weather interceptor has been developed by research engineers at Northrop Aircraft, Inc.

The so-called electronic wind tunnel is constructed on a giant test stand built of a structural steel network and contains all of the mechanical and electrical control devices used in the F-89 harnessed to an electronic computer designed and built at Northrop. Through use of this new device, information on flight performance can be obtained at a fraction of the cost of actual flight tests.

Final response data on the airplane in flight cannot be obtained with the setup, but by eliminating much of the preliminary investigation, actual flight tests can be held to a minimum.

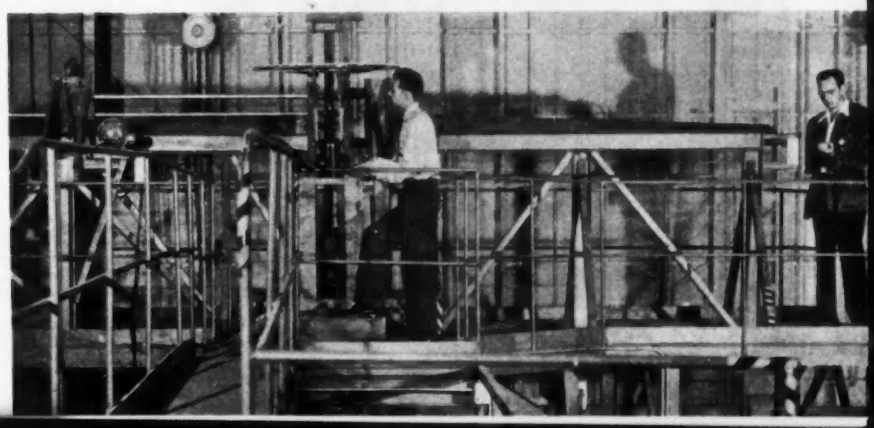
The versatile flight simulation device can test an autopilot under exacting conditions. It serves as a workshop for the development and evaluation of the complete controls system of an airplane under both normal and extreme temperature conditions. In addition, it provides a means for rapid evaluation of the component parts of a power control system by substituting new units into the system.

Various aircraft designs can be studied to determine the best one for obtaining maximum response and satisfactory stability for a proposed airplane.



Test engineers check the operation of F-89 dive brakes on the new test equipment.

Calibrations on the indicator at the elevation section of the apparatus are checked by the engineer at the left while the engineer at the right takes readings from the potentiometer.



Special Handling Setup

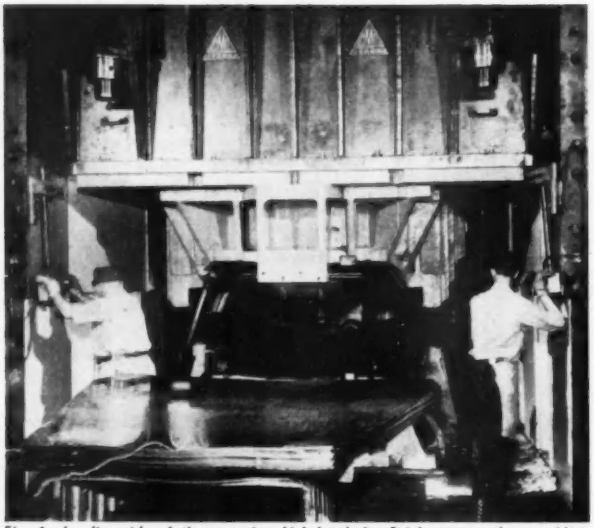


Fig. 1—Loading side of the press in which hoods for Buick cars are drawn. After drawing, an air ejector raises the large stamping from the die before an Iron Hand grips the work piece and removes it from the press.

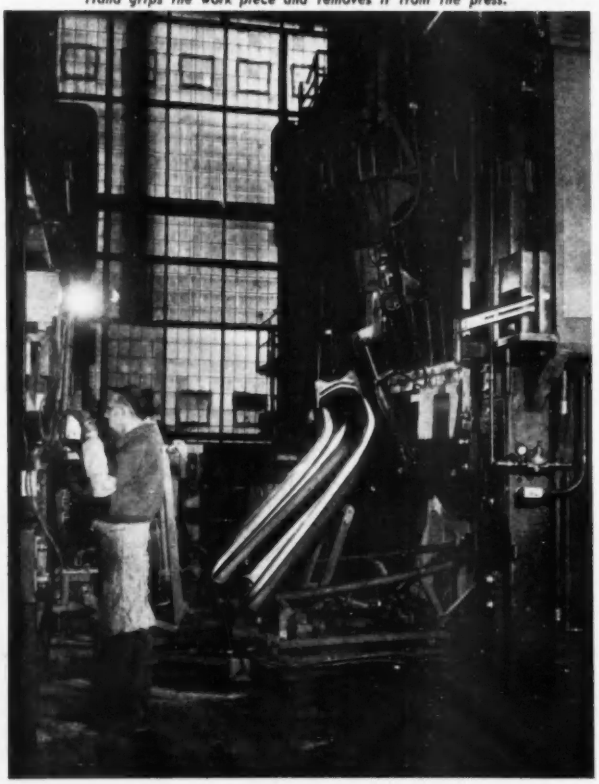


Fig. 2—Draw press, right, from which a load of stampings has been withdrawn by an Iron Hand and dropped in a padded cradle from which the work piece is shown being rocked onto a carriage for shifting to the first trim press, left.

LARGEST of all stampings for Buick chassis are those forming the main hood section produced in the sheet metal department of the Buick Motor Division, General Motors Corp., Flint, Mich. Several steps have been taken recently to reduce hand labor and to expedite hood production economy.

Blanks measure 81⅞ by 83 in. overall but, as the longest edge is considerably greater than that opposite it, the transverse edges converge toward the shorter side. As cutting from oblong blanks would result in considerable waste, shearing is done from coil stock 81⅞ in. wide, and alternate blanks have their longest dimension alternating from side to side of the strip. This avoids waste except at the two ends of the strip.

Blanking is done in a press with a die that shears on both edges and is so large that it has to be skewed rather than square with the press, and overhangs the bed somewhat to get the die into the press. Nevertheless, the die produces two blanks for each closing. Blanks are stacked on skids and usually have to be run through leveling rolls to reduce stretcher strains before being drawn, as the draw is deep and severe, and fractures waste much steel.

Drawing is done in a very large 250-ton Clearing double-acting press and spots on the blank as well as some surfaces of the draw die have to be lubricated, using hand brushes and a mixture of soluble oil and Cresinol oil. Because blanks are so large, two men have to feed them onto an inclined rack down which they slide into the die against stops, as shown in Fig. 1. After the press makes the draw and opens, an automatic air ejector lifts

for Buick Hood Production

By
Jesse C. McClure
Safety Devices Supervisor, Buick Motor Division,
General Motors Corp.

the drawn part up to a position where it is picked out of the press by an Iron Hand and is inverted and dropped into a rubber padded cradle shown at the right in Fig. 2.

This cradle is in line with a carriage that subsequently is moved horizontally by an air plunger to bring the center line of the hood in line with that of the second press, which is offset relative to the draw press. In the cradle is a rubber-covered transverse bar supported on two arms pivoted at their lower ends. Connected to the arms is the ram of a hydraulic cylinder. Outward motion of this ram tilts the stamping upward until it falls over against a padded roller and is there supported on a transverse carriage.

When this carriage is shifted into line with the second press, the rubber-covered roller, which is supported on another pair of air-actuated arms, rocks down to a fixed position leaving the front end of the hood lowered. At this point, a similarly actuated bar on the carriage raises the rear end of the hood until it is nearly horizontal and then pushes the hood over the roller and into the die of the second press. These motions are synchronized with press action and loading of the second press does not push loading buttons, of course, until its dies are open and the prior piece is ejected.

After the second press performs its trim operation and its dies open, the stamping is gripped by an Iron Hand mounted back of this press and is transferred by the hand onto an intermittent conveyor, as shown in Fig. 3. On this International Chain Conveyor, there is room for several

(*Turn to page* 82, *please*)

Fig. 4—Hood stampings being conveyed to a loader that rocks them, one at a time into the first of two dies in the second trim press. Hand shifting to the second cam die in this press is required.

Fig. 3—Iron Hand removing a hood stamping from the first trim press and shifting it onto an intermittent conveyor for transfer to the second trim press. At each forward motion of the conveyor a hood is moved off its discharge end and onto loader for the next press.

Honeycomb In Military

By

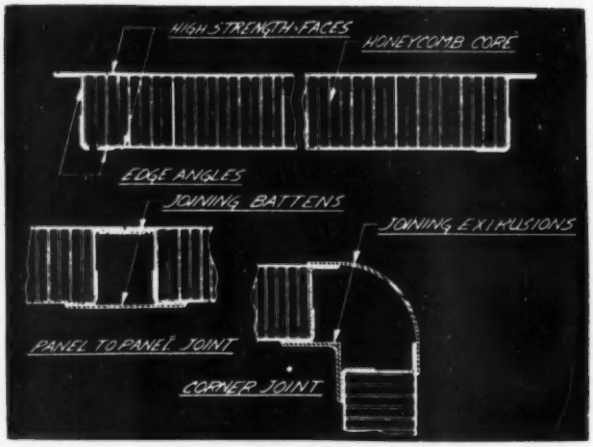


Fig. 1—Typical panel and joint configurations

THE constant search for stronger, lighter structural materials and construction methods has focused considerable attention on the possibilities of honeycomb core structural panels. Panels incorporating a light weight core, separating and bonded to thin high-strength facing materials, are structural units with very high strength-weight and rigidity-weight ratios. Such panels, with their neat appearance, insulation properties and simplicity of assembly, are suitable to many applications in the design of airborne equipment. One such application is in the design of van type trailers which are required to house electronic equipment and the necessary operating personnel. Such vehicles may be required to house ground control equipment used for directing aircraft or missiles or for the detecting and tracking of targets. The operational requirements imposed by such specifically designed equipment can seldom be satisfied if contained in "stock" vehicles. The special requirements associated with the successful operation of this equipment will often indicate the necessity of a specific van trailer design and such design may incorporate honeycomb core panels to good advantage. In this article a number of the possible design requirements will be weighed against the particular characteristics of honeycomb core panel type construction.

Of all of the so-called "sandwich construction" panels, those incorporating a manufactured honeycomb core material appear to be the most promising. There are several core materials now being manufactured in quantity. Among these are 4 oz and 8 oz cotton duck cloth, 60, 70, 110 and 125 lb Kraft paper, fiberglas cloth and 0.002 through 0.006 aluminum foil. A number of other materials are being manufactured experimentally. These materials are manufactured into honeycomb cores having a variety of cell pitches, with ¼ in. and 7/16 in. being the most common. The paper and cloth are impregnated with resin which is cured to hold the core shape. Panels can be fabricated by facing the core with metal, wood, plastic, cloth or paper sheets. The facings can be bonded to the honeycomb with any one of a variety of commercially available resins. These core materials are available for any desired thickness of panel, however, the majority of design requirements have been met with panels less than five in. thick. This has dictated mass production policies. The available mass-produced cores also are limited in length and width by existing production equipment. The core materials are produced in sizes considerably less than that of standard facing materials. Splicing of core segments, therefore, is required for their fabrication into panels.

Honeycomb core material, when bonded into panels, is capable of working the face materials up to their yield strength. To do this the core carries shear loads, resists tension and compression loads perpendicular to the plane of the panel, and stabilizes the faces, preventing premature buckling. For the higher strength cores the bonding of the components of the panel is increasingly critical.

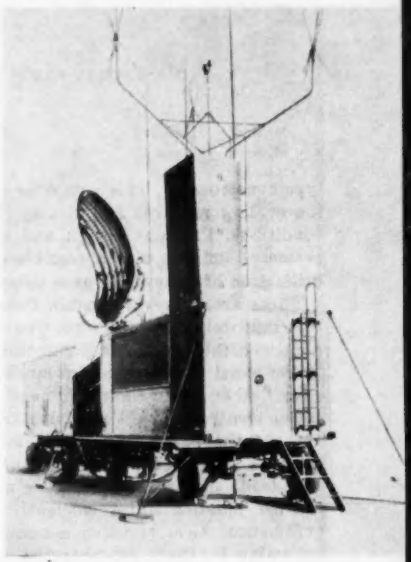
Shear and compression strengths of core materials vary almost directly with the weight of the core; the heavier core being the stronger. Some relative strengths are shown in Table I.

Rigidity in honeycomb core panel construction is a function of the total panel design configuration; with a core material weight-rigidity ratio probably highest for magnesium foil core and then in decreasing order, aluminum foil, impregnated paper and impregnated cloth. Honeycomb construction shows a considerable advantage over fabricated wood or metal panels on a rigidity-weight basis. See Table II.

The insulation properties of a given thickness panel are a function of the core material used, the thickness of the sheet used in its manufacture and the size of the reticule of each honeycomb. Cloth, paper and metal vary from good to poor thermal insulators, in that order. Cells of the core may be

Panel Construction Lightweight Trailers

Bruce Del Mar and Herman Stumpf
Del Mar Engineering Laboratories



Ground control approach radar trailer in operation. Photo courtesy Gilfillan Bros., Inc.

filled with a light weight rigid plastic foam to increase the panel insulation properties. Typical heat transfer coefficients are shown in Table III. (Values are approximate and are for 60 lb-70 lb impregnated paper core faced with aluminum alloy sheets.)

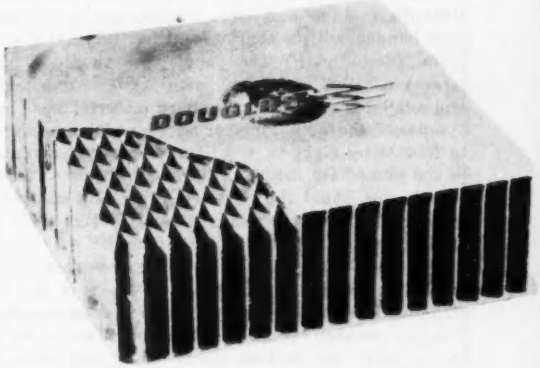
As the designer studies the requirements for some of the more advanced types of electronic units required for radar search and guidance systems used in anti-aircraft fire control and guidance of missiles and aircraft, it becomes obvious that special purpose van trailers will be required in these programs. The special requirements of the future preclude the use of a reworked "stock" van type trailer.

These could be some of the design requirements for the van structure of military lightweight trailers:

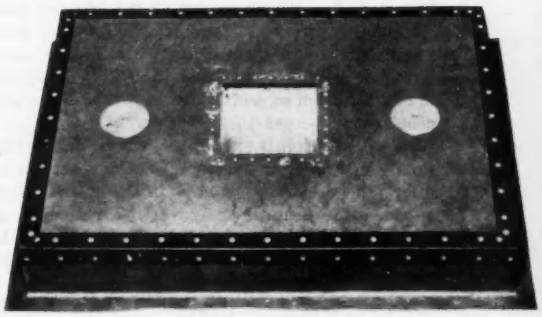
1. Use non-strategic materials.
2. Design for rigidity.
3. Design for air transport—light weight—dimensional limitations—good space utilization.
4. Design for rail shipment—high concentrated loadings—dimensional limitations.
5. Design for highway shipment—dimensional limitations.
6. Design to be sealed in fording and beaching operations, and under driving rain conditions.
7. Design for rough terrain in cross country maneuvers.
8. Design for good insulation characteristics.
9. Design to provide for air conditioning equipment—openings in structure, ducting, etc.
10. Design to provide for electronic equipment—shock mounts, accessible wiring troughs, etc.

Here then appears an excellent opportunity to make use of the special advantages of honeycomb core panel construction.

A non-metallic honeycomb core faced with magnesium sheet, or with any one of several high strength non-metallic sheet materials (such as plywood, masonite, impregnated cloth or paper), meets the "non-strategic" material requirement. Such a panel provides very efficient strength-weight and rigidity-weight ratios. Panels incorporating a non-metallic (impregnated paper or cloth) honeycomb core have sufficiently low thermal conductivity to provide good insulation without added insulation materials. Honeycomb core construction is a panel



Specimen of paper honeycomb core with aluminum alloy faces. Photo courtesy Douglas Aircraft Co., Inc.



Test section of honeycomb core panel showing edging angles and inserts. Photo courtesy Douglas Aircraft Co., Inc.

type construction. This would be essential to obtain the sealing required for fording, flotation and rain conditions. Previous design and manufacturing experiences indicate also a possible cost saving in the utilization of honeycomb core panel construction.

There are, however, certain definite limitations to this lightweight core design. One is in the handling of concentrated loadings, particularly shock loadings. If the panel is considered in much the same manner as any other lightweight skin panel construction, and the concentrated loads are taken over a considerable area of the panel, and if special consideration is given to eliminating or at least minimizing the tension loads in the core to face glue line, such loads can be handled quite efficiently. Previous design experiences have revealed a number of methods of designing for these concentrated loadings, and using rugged core material to resist shock.

For the application of honeycomb panels to lightweight trailers, the panel can incorporate high-strength facings and edge angles and honeycomb core bonded with a thermal-setting, thermal-plastic resin. (See Fig. I.) The panel sizes should be the largest possible consistent with trailer components and available materials. Standard material sizes and standard bonding equipment accommodate panels up to four ft by eight ft. With larger presses available in the immediate future, it will be possible to fabricate in one panel the entire roof or side wall of a trailer. The panels should be of such design as to be readily assembled, replaced or repaired.

Care should be taken to have the honeycomb core determine the panel thickness. Nowhere in the design should there be any part such as edge banding, framing around openings, doors, or inserts, which would hold the facings away from the core. In bonded, as in riveted or bolted structure, the quality of the assembly determines the ability of component parts to do the portion of the work for which each is designed. For the integrity of the bonded panel assembly, then, nothing should be allowed to interfere with the "glue" line contact of the component parts. After bonding, the panel should be completed by the installation of additional angles and it should then be sealed to keep the core dry.

Panel to panel joints may be made with flat battens, as shown in Fig. I, or by any one of a great variety of other joint designs. Openings in the panels should be of the same general design configuration as the edging of the panel, with effort made to keep the bonded angles on the same face as the edge angle. Doors, covering these openings, of course, must be designed to meet certain specific requirements for their appointed operation, but should be of such design that the door and the door frame may be installed after the panel is completely bonded and sealed.

Concentrated tension loads can be taken in the panel to panel joint concentrations of material or through bushings which apply a compression load to the panel itself. Through bushings should be designed as inserts to be installed after the panel bonding operation. It is then possible to properly install those which require coordination from panel to panel or to install additional inserts at any time. Service experiences or changes in equipment may require that inserts be moved or added, perhaps even in the field.

Shear loadings can be taken in the panel face to which the load is applied. Concentrated compression loads and impact loads can be taken by the face material and the core; and might be influential in determining the facing thickness and core density.

In the above paragraphs the general characteristics of honeycomb panels have been discussed with respect to their application to military lightweight trailers. If we now make a critical comparison of its advantages with respect to a more conventional sheet metal frame type construction, it will become apparent that it has an outstanding combination of good physical qualities which make it particularly suitable to this job.

Honeycomb panel structure provides the most efficient placement of strong material to give strength and rigidity in bending—right at the outer surface. Furthermore, the surface material is kept by the honeycomb from forming shear wrinkles common to other thin sheet structures, so this structure provides far less deflection in shear. Deflection tests often show these structures working its materials above ¾ their elastic modulus or E value.

Weight

The strength efficiency of honeycomb panel structure is very high in terms of material used. All the surface material can be worked in compression to stresses which closely approach their block limit values instead of only an effective width of surface material adjacent to longitudinal stiffeners in more conventional sheet structures. The result is a much lighter weight structure. However, bending strength is not the only consideration and when durability is made equivalent by a good rugged design, this weight advantage is cut down to a small margin.

Insulation Qualities

The insulation quality of honeycomb panels is built right into the structure; particularly when

(continued)

paper core or even cotton duck core is used. Edge closure strips on the panels conform to insulation requirements when made at least in part from phenolic or other plastic materials of low conductivity. Where a very high degree of insulation is required, and even radiant and convection heat transfer is to be held to a minimum, a lightweight foam material can be placed in the core reticules without seriously affecting the simplicity of the panels.

Space

Honeycomb panel structure can be so compacted into thin walls that more interior space is available for electronic components and personnel in military lightweight trailers.

Sound Deadening Quality

Conventional trailer wall structure leaves the outer surface sheets free to vibrate sufficiently in transit to amplify ground noise. The trailers using honeycomb panels are not only quiet inside in emplacement but are proving quiet in transit, even while undergoing tests on the Army Ordnance Belgian Block Road at Aberdeen Proving Grounds, Maryland.

Cost of Materials

Unit cost of materials when using honeycomb panel construction can be expected to be at least equal and probably less than with conventional frame construction, assuming equivalent physi-

(*Turn to page* 84, *please*)

TABLE I

Strength Properties of Honeycomb Core

	Cell Pitch (in.)	Weight (lb/ft³)	Crushing Strength (psi)	Shear* Strength (psi)
60 lb paper (impregnated)	0.440	1.70	130	40
70 lb paper (impregnated)	0.437	2.18	140	51
110 lb paper (impregnated)	0.475	2.95	240	53
0.003 aluminum foil	0.375	4.20	455	85
0.002 aluminum foil	0.250	4.30	475	90
4 oz. cotton duck (impregnated)	0.440	4.70	380	90
125 lb paper (impregnated)	0.345	4.90	620	162
0.004 aluminum foil	0.375	5.40	660	140
0.003 aluminum foil	0.250	6.10	780	175
0.004 aluminum foil	0.250	7.85	1090	270
8 oz. cotton duck (impregnated)	0.440	8.60	1000	204

**These values are for transverse core direction. Shear properties in longitudinal direction are approximatly 1.6 times this figure.*

TABLE II

Rigidity Factors in Beam Construction

Beam Description	Weight (lb/ft²)	Panel Thickness (in.)	I (in.⁴)	E (x 10⁶)	Rigidity Factor EI (in.⁴)
0.016 aluminum	.....	.....	.....	.....	.....
Faced paper honeycomb	0.734	1.032	0.099**	8.0**	792,000
Birch plywood	0.734	0.157	0.00416	1.25	5,200
Aluminum	0.734	0.051	0.00013	10.5	1,390
Steel	0.734	0.018	0.0000058	30.0	174

***E & I are for face material only, neglecting core. E is taken as 0.8 times face material E value to account for core shear deflections.*

TABLE III

Thermal Properties

Panel Thickness	U (Btu/hr/ft²/°F) Plain	Filled
1 in.	0.41	0.26
2 in.	0.27	0.15
3 in.	0.21	0.10
4 in.	0.17	0.08

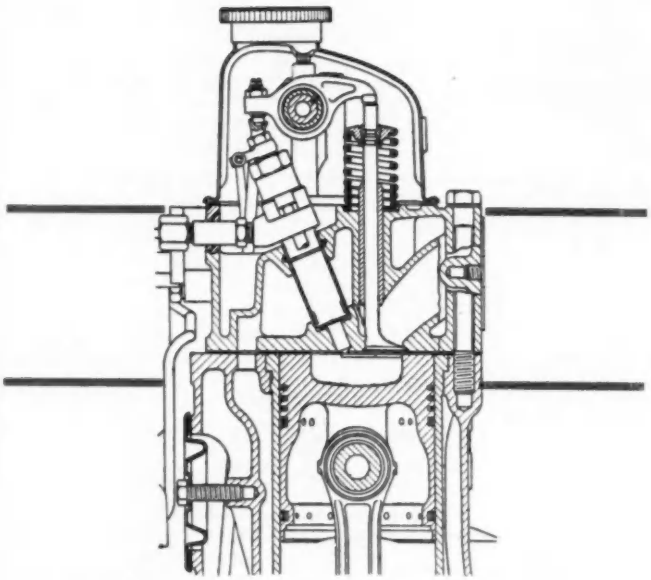
New Tractor Engine Convertible for Different Fuels

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

DAGENHAM, ENGLAND

An outstanding feature of the Fordson Major tractor, built at the Dagenham Works in England is an overhead-valve engine which can be converted for operation on Diesel fuel, vaporizing oil, or gasoline. This has been done with a maximum number of units common to the three types, with a resultant reduction in manufacturing costs, making the Diesel substantially cheaper than any previously produced by Ford.

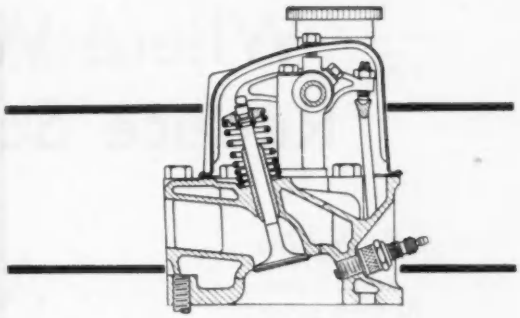
The four-cylinder block common to all three types has detachable wet liners, a five bearing crankshaft, valves in head, with pushrod and rocker operation. The Diesel and vaporizing oil models have a bore of 3.97 in. and stroke of 4.56 in.; the gasoline model has the same stroke but the bore is only 3.77 in. Piston displacement of the engines is therefore 220 cu in. for Diesel and vaporizing oil and 199 cu in. for the gasoline type. The Diesel has a compression ratio of 16 to 1 and is fitted with aluminum alloy five-ring pistons with recessed heads, into which the fuel is injected through four-hole nozzles. Horsepower at 1600 rpm is 35.8 for the Diesel, 34.9 for gasoline and 34 for vaporizing oil.



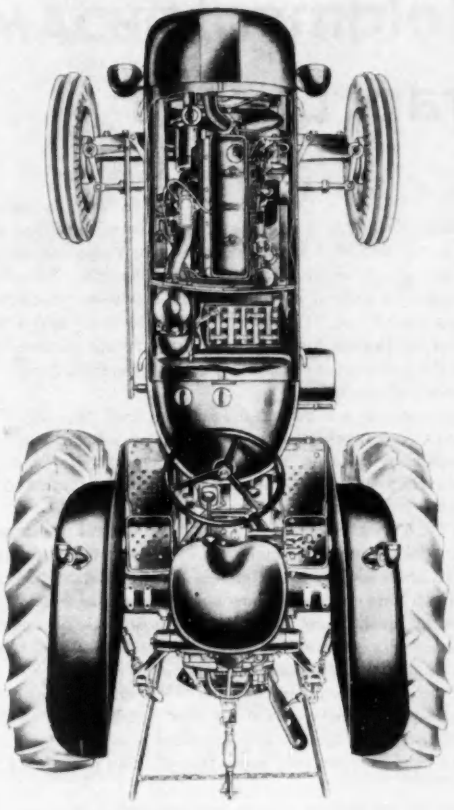
This transverse section shows details of the piston and cylinder head of the Diesel engine. Note that the lower surface of the head is flat and a cavity in the top of the piston forms the combustion chamber. (Illustration courtesy of Automobile Engineer, London)

Interchangeability of parts is common between the evaporizing oil and the gasoline models. The special head for the former gives a compression ratio of 4.35 to 1, while the ratio for the latter is 5.5 to 1. Ignition, cooling, electrical and starting systems are the same for both models. Special intake manifolding is used on the model that burns vaporizing oil to provide more heat for the heavier fuel. An additional carburetor, controlled from the instrument panel, supplies gasoline for starting.

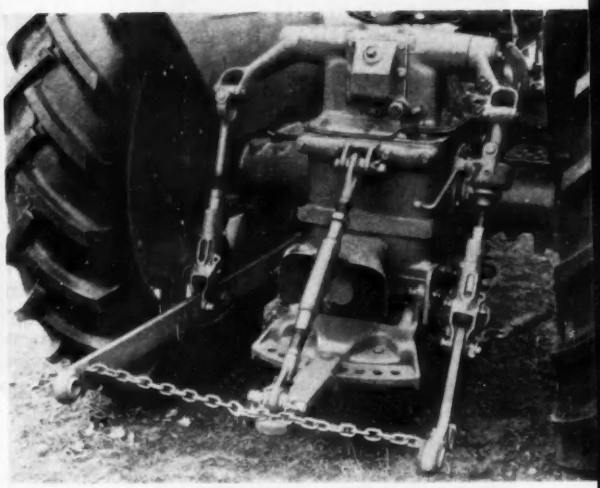
An 11-in., single-plate dry clutch transmits the power to a six-speed constant mesh type of gearbox. Twin selector control levers are used, the primary lever giving a high and low ratio



A flat-topped piston is used in the gasoline and vaporizing oil engines which have the combustion chamber formed in the head as shown in this transverse sectional view. (Illustration courtesy of Automobile Engineer, London)



(Above)—Part-cutaway view of the Ford Major tractor shows arrangement of the power plant and other units.



(Right) Hydraulic actuation of attachments is by oil from a gear-type pump located in the rear trammission housing.

and the main lever giving three forward ratios and one reverse. Final drive is by spiral bevel and spur pinions. Front and rear axles are adjustable in four-in. steps, the front going from 49¾ in. to 73¾ in., and the rear from 52 to 72 in. Front tires are 6.00-19, and rears 11.00-36.

A gear-type hydraulic pump, located in the rear transmission housing, has an output of 3.67 Imp. gpm at a pressure of 2000 psi, with an engine speed at 1400 rpm. The hydraulic mechanism consists of one-lever control for rear-mounted attachments, through a ram cylinder, cross shaft, and lift arms.

Wheelbase is 80 in. and overall length 130.5 in. Weight, with full equipment, including power take off, hydraulic pump, linkage, belt pulley, and electric lighting, is 5100 lb with Diesel engine, 4970 with vaporizing oil engine and 4950 for gasoline use.

Ford is also producing this tractor as a full track and as a half-track, the former having track plates of 12, 14 or 16 in. The half-track really forms two tractors in one, for the pneumatic-tired wheels can be replaced at will. It provides for four, five and six furrow plowing.

Where Weldments Reduce Scrap Losses

By Ray Zeh
Welding Engineer
The Lincoln Electric Co.

Fig. 1 Planet carrier built up as a weldment from two steel disks to which steel hubs and spacers are arc welded.

An example of the economies sometimes achieved by weldments is found in the double-drum cable control unit manufactured by Gar Wood Industries, Inc. This device is adaptable to several models of Allis-Chalmers tractors for operating Gar Wood "Tipdozers," "Dozecasters," and similar on-tractor equipment for earth moving purposes. Cables operated by the unit also control off-tractor scrapers, rippers, and like equipment.

Its components are mounted inside a steel housing which has always been fabricated from steel plates joined by welding and covered by a sheet steel shell. Formerly, however, the planet carrier, the drive housing, the clutch drum, and the cable drum were castings.

Recently, it was decided to convert the steel castings to weldments, which could be made with equipment already available or on order and by labor experienced in flame cutting and arc welding. This course has now been followed and weldments are proving much more satisfactory than castings were before. Weldments save some weight in certain cases, but in others are slightly heavier than castings.

In the redesign, however, sections were not altered greatly, partly because the parts were made interchangeable with those previously cast, and this made it essential to keep many dimensions the same as before, even though the weldments are stronger.

Most of the weldments require less machining than castings, even though a part of the saving on this score is offset by labor in welding. Initially, all welding was done by hand but recent application of semi-automatic hidden arc welders has reduced welding costs about one third. Even without this

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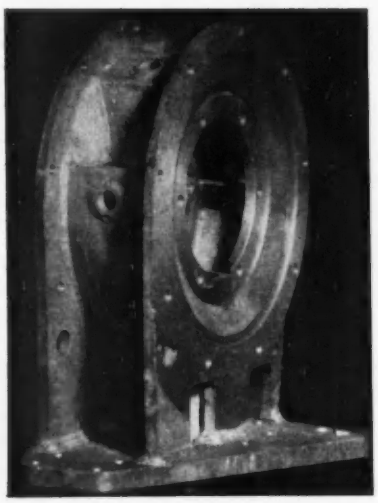
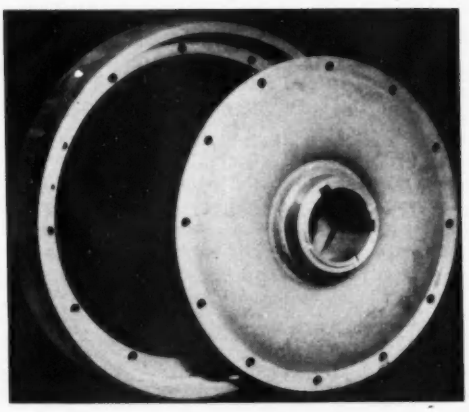


(Left) — Fig. 2 Welded drive housing having pressed steel flanges, two of which are dished and subsequently welded to the base flange. Between these two disks a notched cylinder is welded.



(Right) — Fig. 3 These two parts, a steel flange with hub welded in place and a cast meehanite ring, constitute the present clutch drum. The cast ring is used to provide a good braking surface.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

High Percentage of Cancellations of Orders By Government Agencies Hits Machine Tool Builders.

Machine Tool Index

Preliminary figures prepared by the National Machine Tool Builders' Association for May point out that the machine tool index of new orders dropped 7.2 per cent from the previous month. The percentage as compared with the 1945-47 base is 286.3. The foreign order index, however, took a 15.8 point jump in May to 31.4 per cent — the highest level since last January. Shipments, now at 322.3, showed a 14.4 per cent increase over April. The unfilled order ratio is at its lowest point—13.7 to 1—since December, 1950.

The Cancellation Blunder

During May, the cancellations of machine tool orders by the Government amounted to 45 per cent of the new orders placed that month. There is no doubt that the elastic properties of our defense program in speeding up and slowing down defense production have taken their toll on the machine tool order books. Of course, cancellations are in part due to the recently announced lengthening out of the defense program, but the most inexcusable reason is due to over-ordering by defense production planners. According to industry sources, many of the cancellations have involved machine tools which were virtually completed and on the assembly floor.

Now after much ado about establishing a strong machine tool industry, the Government has taken a complete reversal of its former policy in upholding high manufacturing rates. With the current setup, the industry in many instances will have no certainty of continuous production, especially when companies are not permitted to take on unrated orders to fulfil extra capacity. Even the recent NPA proposed amendment to M-41, which would permit the acceptance of unrated orders if such business does not delay rated orders beyond required delivery dates, will not fully alleviate the situation. The Machine Tool Advisory Committee has recommended a return to the formula as it originally prevailed when M-41 was issued early in 1951.

While the Government is playing around with proposals, both the foreign and domestic markets are shipping to European builders who do not have to concern themselves with ratings.

Remedy for Tool Imports

American imports of machine tools will probably reach the startling figure of $44 million this year. This compares with $2.3 million in 1950 and $13.7 million in 1951 According to members of the National Machine Tool Builders' Association, there is one remedy within their control—one not dependent upon Government action. This remedy is better design, better materials, better workmanship, more aggressive and vigorous selling, and better service to the machine tool customer.

Wanted—Engineers

Monarch Machine Tool has come up with a clever booklet on selling fresh-out-of-college engineers on coming with the company. Even if the young engineers don't go with Monarch after reading the literature, chances are that they won't forget the Monarch lathe in a hurry.

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CERTIFICATE OF NECESSITY

Summary to May 1, 1952

MAJOR PROGRAM	APPROVED						PENDING		
	For Period of Feb. 25-Apr. 15, 1952			Cumulative As of April 15, 1952			As of April 15, 1952		
	No.	Amount ($000)	Percent of Total	No.	Amount ($000)	Percent of Total	No.	Amount ($000)	Percent of Total
Machinery (except Elec.) & Parts	221	75,885	2.0	1,309	554,551	3.0	674	194,000	2.5
Elec. Mach. Equipment & Supplies	106	25,042	.7	519	304,390	1.7	298	99,468	1.3
Total for All U. S. Industry	1,580	3,825,879	100.0	9,068	18,404,973	100.0	5,184	7,841,843	100.0

Source: Department of Commerce.

Metalworking Machinery—Except Machine Tools
Quantity and Value of Shipments by Class of Product
1951-1950
(thousands of dollars)

Class of product	1951		1950*	
	Number	Value fob plant	Number	Value fob plant
METALWORKING MACHINERY TOTAL	.....	$214,567	.....	$155,007
Presses (including forging)	19,673	106,994	14,996	74,796
Forging machines (except presses)	1,367	15,354	1,246	9,953
Punching and shearing machines (power)	5,152	26,696	3,961	18,776
Punching and shearing machines (manual)	5,380	1,349	5,148	1,072
Bending and forming machines (power)	6,372	27,408	6,094	20,208
Bending and forming machines (manual)	15,140	3,031	16,677	2,624
Riveting machines (except hand-held portable type)	3,354	4,279	3,319	3,401
Metal-container making machines	1,969	15,304	2,122	12,469
Die-casting machines	294	4,707	313	4,694
Wire-weaving and wire-fabricating machines	913	4,487	572	2,849
Drawing machines and draw benches	510	4,977	374	3,982

* Revised.
Source: Department of Commerce.

NEW EQUIPMENT PLANT • PRODUCTION

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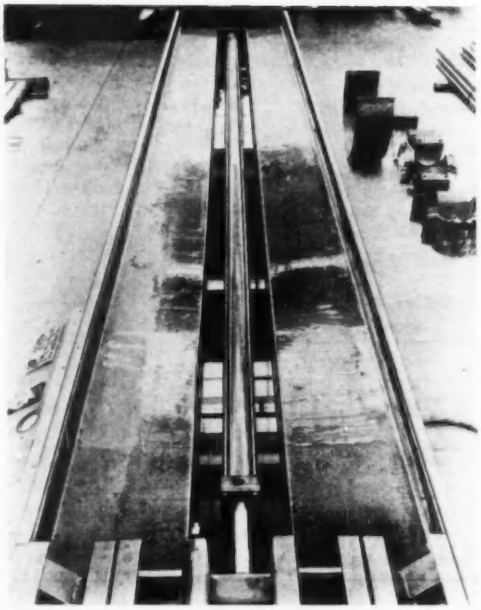
Long Stroke Hydraulic Cylinder



Miller 22-ft hydraulic cylinder.

A 22-ft stroke hydraulic cylinder, built from standard-type cylinder parts and that features a piston rod that does not sag under its own weight, is said to open up many new applications for air hydraulic cylinders by the manufacturer.

This unusual cylinder is a four in. bore, double acting, low pressure hydraulic cylinder with a 24-ft long 2½ in. diam solid steel hard chrome plated piston rod. Construction and operation of this cylinder has made it possible for the Planet Products Co. to design and construct a completely automatic, cylinder operated, honing machine that hones air and hydraulic cylinder tubing to a 15 micro-in. finish in up to 22-ft lengths and in up to 20-in. bores. The cylinder is used on this machine to operate the honing machine carriage continuously back and forth at 120 fpm.

The cylinder itself is of standard construction, with square, solid steel heads and caps, dirt wiper seal, and a leakproof rod seal. *Miller Motor Co.*

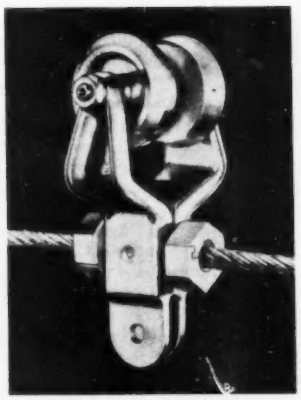
Circle E-1 on page 65 for more data

Materials Handling Conveyor

Installations are being made in automotive plants of a different type of cable conveyor system that has been recently developed. This system employs a light, durable 9/16 in. steel core cable as a connecting medium between trolleys on overhead conveyors for heavy duty materials handling systems. Practical utilization of this arrangement is said to stem from the development of the D-G split retaining nut which exerts a 360 deg compression on the cable. The bracket sleeve, on which the split nut operates, has internal serrations which bite into the cable and thus permit the bracket to be held securely in a fixed position.

Advantages claimed for the D-G cable conveyor are: unusual strength and durability; easy maintenance, since the assembly can be readily removed and replaced; uncommon flexibility. Moreover, motive power can be applied from "traction-turn" wheels or caterpillar assemblies. *Daigle-Gaboury, Inc.*

Circle E-2 on page 65 for more data



D-G cable conveyor.

Universal Die Cushions

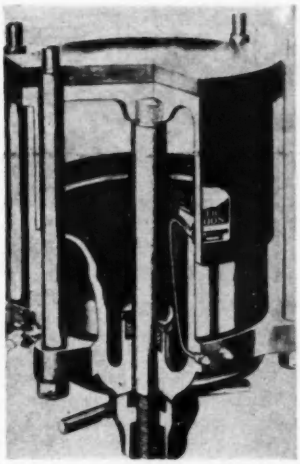
Greater strength is the feature claimed for die cushion designs which have been recently introduced.

A fully hardened and ground pin pressure pad, to fit the press bed opening, is said to provide alignment of the pin pressure pad at all times. The hardened and ground pin pressure pad is kept in parallel alignment during the work cycle by an oversize hardened and ground, chrome plated, fully guided, reciprocating cylinder section of the die cushion.

These units are now so designed that they can be fastened directly to the bolster plate or provided with a mounting plate whereby they can be installed on the press bed.

This unit comes complete ready to install with a combination reducing regulating valve and pressure gage. All cushions operate from air pressure available from the average shop air line. *Dayton Rogers Mfg. Co.*

Circle E-3 on page 65 for more data



Dayton die cushion.

Gage Lubricant

Savings by increasing the life of precision gages is the claim for a lubricant that has been put on the market. The manufacturer states that use of this Micronoil Gage Lube will increase from five to ten times the life of all types of precision gages and make possible inspection with greater accuracy. It is said to be a non-gumming, non-loading, non-freezing liquid with rust inhibiting qualities, with a maximum total film measurement of 0.000020 in., so there is no dimensional changes of the gages. The manufacturer claims that it is particularly effective in preventing damage to screw threads with soft metals, such as aluminum and magnesium; also that it stops chrome peeling and chipping. *Protective Coatings, Inc.*

Circle E-5 on page 65 for more data

Universal Milling Cutters

Now being offered is a line, called Universal Line, of face mills and shell end mills.

Shanks of the blades of the cutters are round. The round holes for the blade and the maker's Super-Jack blade locking wedge overlap radially on center in the alloy steel body and thus provide space for up to four times as many blades as the cutter diameter if extremely fine pitch is desired. A groove in the shank of each blade engages a tongue in each blade slot in the body.

Any Universal body can be used for any cutting requirement including right-hand or left-hand rotation; with carbide or high speed blades; using positive or negative angles. *McCrosky Tool Corp.*

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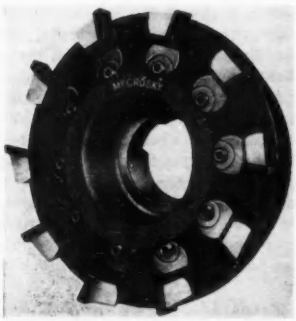
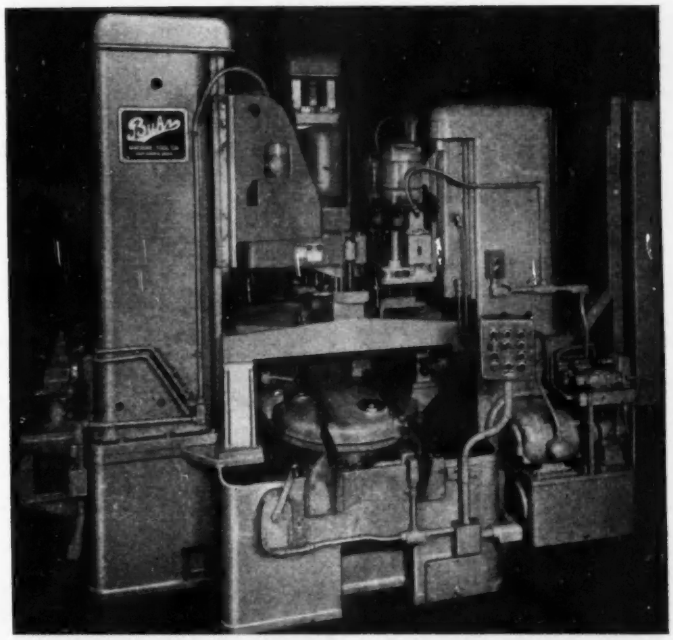


McCrosky, Universal Line, milling cutter.

Special Machines for Jet Engines



Special machines consisting of a main base, to which are mounted four vertical hydraulic drill units, a single-part holding fixture, and a 36 in. diam 10-station (unequally spaced) index table and a central coolant system have been designed for the jet engine program.

For tool safety, the machine has been constructed so that the No. 2 unit must complete a work cycle followed by one index, before the No. 3 unit can function. Special control equipment also guarantees a complete work cycle by both the No. 2 and No. 3 units before the No. 4 unit can begin, according to the manufacturer. In addition, two complete revolutions of the index table are required to complete one part, and all of the machine's moving parts are automatically lubricated. (Buhr Machine Tool Co.)

Circle E-6 on page 65 for more data

(*Turn to page 60, please*)

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 65

(Continued from page 59)

Straightening Press

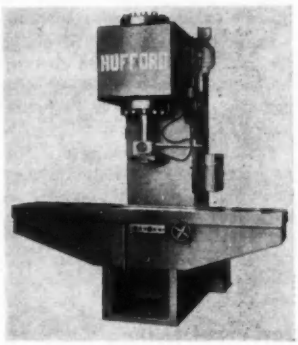
A hydraulic straightening press for sensitive work has been recently introduced. An unusual feature according to the maker is an automatic stroke limiter, which protects against overbending.

A vertical shipper rod attached to the side of the frame of the Model 85 press is linked to a hand lever which serves as a manual control for the press. In shifting this rod up or down, fluid volume from the variable volume pump is increased or decreased in proportion to lever displacement. A stop, attached to the shipper rod, is engaged by the ram in its descent, gradually bringing hydraulic volume to zero and halting the ram automatically at any predetermined position.

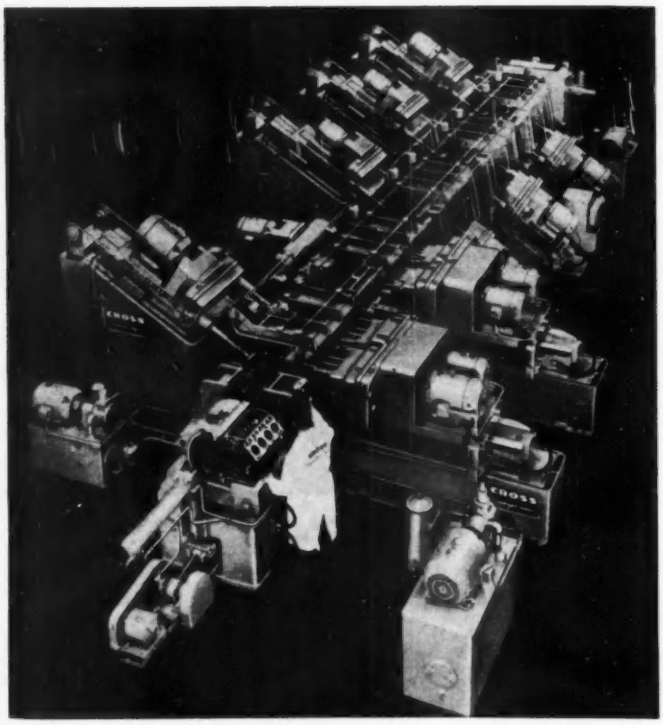
To accomplish rapid stroke alterations a special attachment is furnished. In this, a thread shipper rod is rotated by a reversible motor controlled by push buttons. The stop, being threaded to this lead screw, is thus automatically shifted up or down as rotation occurs. Final micrometer settings are made by means of a handwheel connected to the screw by a gear box. One handwheel revolution equals 0.125 in. of ram travel. An automatic counter indicates ram extension to within 0.010 in. from the starting position and a dial gage shows applied force from zero to 150 tons.

Maximum daylight of this press is 30 in. Minimum daylight—10 in. Throat depth—19 in. Table size—21 in. by 108 in. Pressing speeds—zero to 48 ipm. Retracting speeds—zero to 65 ipm. *Hufford Machine Works, Inc.*

Circle E-7 on page 65 for more data



Hufford hydraulic straightening press, Model 85.



Cross transfer machine for V-8 cylinder blocks.

Transfer Machine for V-8 Cylinder Blocks

Completion and delivery of a special machine tool for production of V-8 cylinder blocks has been announced. The machine drills, bores, spotfaces and reams 120 cylinder blocks per hour at 100 per cent efficiency.

It consists of 19 stations. One is utilized for loading; ten are for drilling, boring, reaming, countersinking and spotfacing; two are for gaging; one is for cleaning; four are idle and one is for unloading.

Hydraulic and electrical construction is to Joint Industry Conference standards. Locating, clamping, positioning and transferring is accomplished hydraulically.

A Cross machine tool control unit is incorporated to automatically stop the machine when any tools need changing. Pre-set tools are on the job for use when needed, thus reducing machine down-time, decreasing tool breakage and minimizing scrap loss since the machine is automatically stopped before tools "lose size."

Standard sub-assemblies are used. *Cross, Co.*

Circle E-8 on page 65 for more data

Automatic Transfer Machine for Clutch Housing

An automatic 22-station transfer machine for performing a sequence of varied operations on a cast iron clutch housing has been designed and built.

Operations include drilling, rough and finishing boring, milling, sawing, tapping, spotfacing, counterboring, and chamfering—total of 37 operations on 105 surfaces or holes of various dimensions. Production rate is 124 workpieces an hour at 80 per cent efficiency.

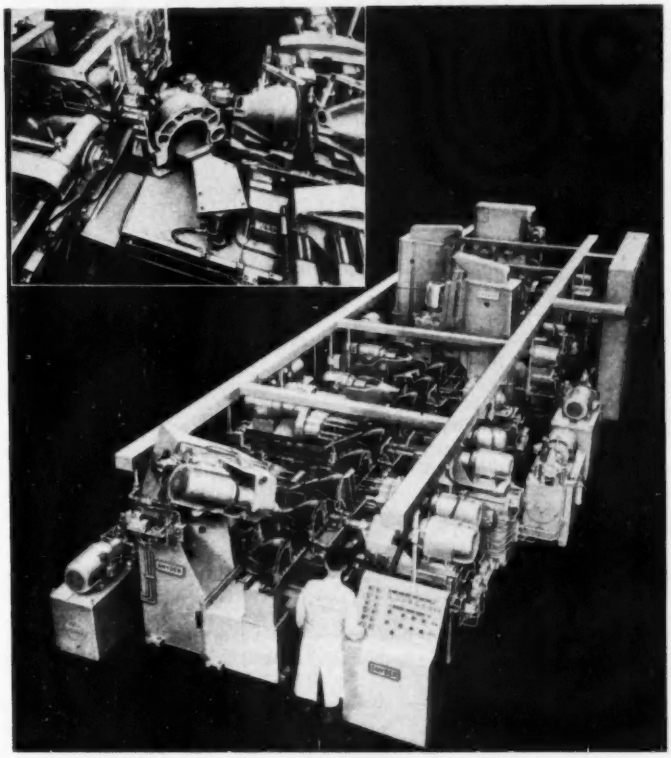
Several unusual features are claimed in this machine. One of these, a tooling feature, is in Station 1 where a 2 in. diam breather hole is trepanned from the solid casting and finish bored with one tool.

At Stations 8 and 9 normal positioning of milling cutters and transfer rails would have resulted in interference. The problem was solved by dropping a section of the rails through cam action linked to the milling units.

At Station 16, the workpiece is turned 90 deg and transferred to another set of rails for further processing in the new position, without being permitted to vibrate or move out of correct location during the transfer movement.

Clamping is hydraulic through cams and there are two stations to each cylinder. The double stationary fixture is desgined to clamp one or two parts. Work cycle is automatic, but manual push-button control is optional.

The machine is completely interlocked electrically so that any partial index, feed, stroke or improper clamping will stop the machine cycle.



Snyder automatic 22-station transfer machine.

Slide units and tapping units are standard and fixtures, heads and transfer mechanism are designed especially to coordinate with these units. *Snyder Tool & Engineering Co.*

Circle E-9 on page 65 for more data

Flexible Neoprene High Capacity Pump

The Ace Jabsco flexible neoprene impeller pump is now available in hard rubber construction for handling acids, alkalies, and other corrosives. It is ¾ in. in size and delivers 15 gpm at 22 ft head, or five gpm at 72 ft head. The maximum capacities are 95 ft head or 16 gpm. It pumps viscous or thin liquids. It is resistant to alkalies, solutions of metallic salts, inorganic acids, hydrochloric acid any strength—in fact, any liquid that can be handled by neoprene.

The Ace Jabsco pump is self priming. It is said to start against suction lifts of six ft without a foot valve. When primed, it will handle suction lifts as high as 14 ft.

Ace neoprene impeller pump.

Motor utilized is a ½ hp, 1140 rpm, polyphase, close-coupled with the impeller mounted directly over the Hastelloy motor shaft. *American Hard Rubber Co.*

Circle E-10 on page 65 for more data

Cleaner for Phosphating

A compound designed especially for use as a precleaner for steel that is to be deep drawn or extruded has been announced. The compound, Detrex 61, is used in a soak tank at approximately 190F at a concentration from six to 10 ounces per gal. It has high wetting, penetrating and rinsing properties. *Detrex Corp.*

Circle E-11 on page 65 for more data

(*Turn to page 62, please*)

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 65

(Continued from page 61)

Small Size Jig Borer

Currently in production is a small-size jig borer, which is the second model of a series of completely new design jig borers. It is the smallest of the new machines which feature the Electrolimit measuring system, and has been designated the No. 1E.

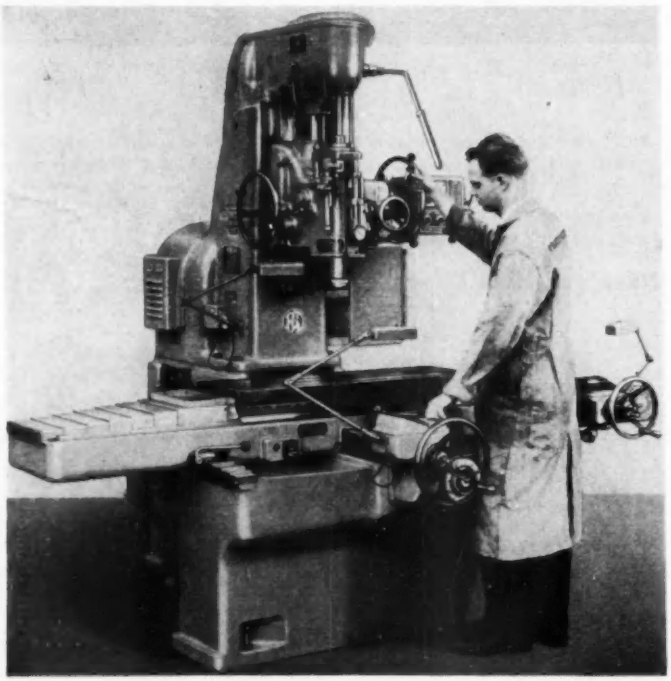
According to the maker, No. 1E provides an unusually accurate machine for precision locating, drilling and high-speed boring in small work. Design improvements in the machine include: a heavier and wider bed construction, table and carriage way telescoping guards, built-in Electrolimit measuring system, a new design quill mounting and a handy control center.

Table settings accurate to 0.0002 in. are said to be made quickly with the Electrolimit measuring system. Two measuring units, entirely independent of traversing screws, control the longitudinal and transverse settings. Basic one in. spacings are obtained electromagnetically from a solid master bar and registered visibly by a zero reading on an indicating meter. Fractional inches are obtained by moving a small electromagnetic unit between the inch spacings on the master bar with a super-precision micrometer screw. A large 4½ in. micrometer barrel allows reading to 0.0001 in.

Spindle speeds and feeds have been increased. No. 1E has 16 spindle speeds ranging from 65 to 2800 rpm and four spindle feeds, both up and down, from 0.0006 to 0.006 ipr.

Two table sizes are available with increased longitudinal travel on the large size. The 12 by 24 in. table has 18 in. longitudinal travel and 12 in. transverse travel and the 12 by 42 in. table has 36 in. longitudinal travel. Special columns four or six in. higher than standard can also be furnished to increase the normal 20 in. capacity between table and spindle. *Pratt & Whitney.*

Circle E-12 on page 65 for more data



Pratt & Whitney jig borer

Profiling Machine

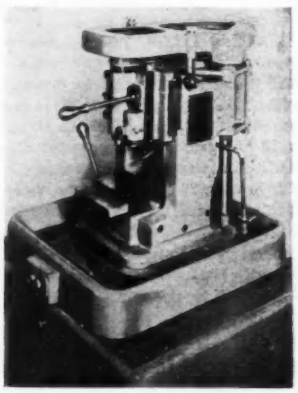
According to a recent announcement, several new features have been embodied in a precision profiler. It is claimed to be much heavier, and has a vee-belt drive. Previously offered for bench mounting only, a pedestal metal cabinet has been designed for the precision profiler as optional equipment.

The profiler has new cutter holder collets with improved grip. The same collet is used in the follower spindle. A follower spindle parallel with the main spindle holds the follower spindle cutter for producing templates from sample.

It is stated that this compact, rugged machine is especially designed for profiling, milling, slotting, recessing and routing operations on a great variety of small mechanical parts.

The profiler requires a floor space of 24 in. by 26 in., and is 57 in. high. A standard 1750 rpm, 1/3 hp, three-phase motor provides eight spindle speeds, ranging from 437 to 7000 rpm. Working area is two in. by four in. horizontal, 1¼ in. vertical. *Wade Tool Co.*

Circle E-13 on page 65 for more data



Wade precision profiler.

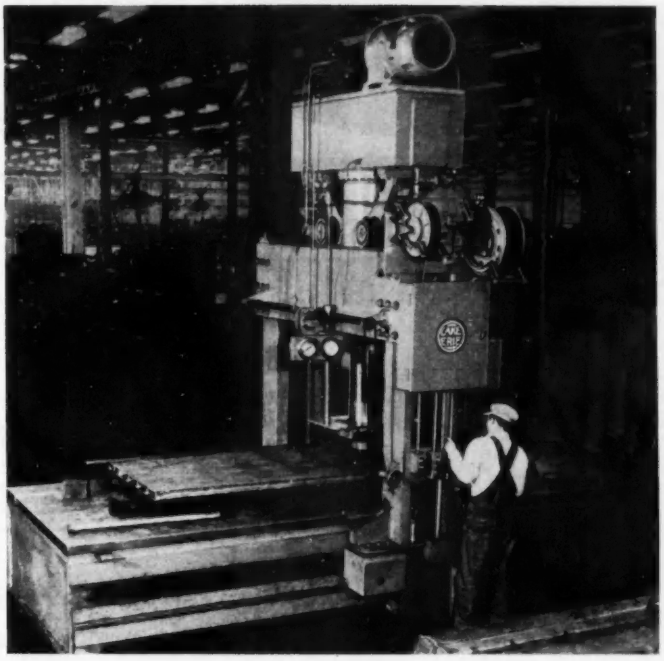
Travelling-Head Straightening Presses

Travelling-head straightening presses now available represent an addition to a complete line of straightening equipment. These presses, ranging in capacity from 200 to 200 tons, feature optional two-speed ram travel in both longitudinal and transverse directions over the entire bed area. They are available with either one or two travelling heads on the same bed frame.

The presses feature dove-tailed keys on the side frames which grip the bed in a pincer-like action during pressing operations. Additional rigidity is provided by large horizontal keys which secure the side frames to the cross-head above the bed and to the cross-tie below the bed.

Other features of this improved line of straightening presses include the use of wheels for traversing action, totally enclosed gearing, adjustable pressure and stroke controls, combination of pushbutton and hand lever controls, and fast-opening surge valves. *Lake Erie Engineering Corp.*

Circle E-14 on page 65 for more data



Lake Erie straightening press.

Precision Thread Grinding Machine

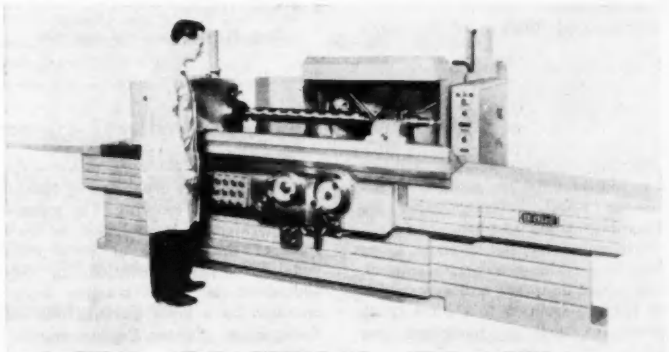
The Style 36 precision thread grinder, which has been recently put out, is a large-capacity machine for grinding threads, worms and other forms. It will grind single or multiple threads, left or right hand, in any pitch from one to 128 threads per in., according to the maker. It can be used with single or multiple-rib grinding wheels. An attachment for grinding internal threads also is available.

The relation of work spindle speed to table feed can be changed to produce various leads. This is accomplished by means of change gears. Most standard leads can be obtained by the use of a set of gears furnished with the machine.

Right or left-hand threads may be ground by positioning a lever. Setting the lever to a neutral position permits indexing the work spindle for grinding multiple-start threads and worms.

Automatic functions of the thread grinder include feed to finish size, wheel dressing, work size compensation for dressing, resumption of the grinding cycle after dressing, backlash compensation, control of the coolant flow, lubrication, and retracting the wheel at the end of the grinding cycle. *Ex-Cell-O Corp.*

Circle E-15 on page 65 for more data



Ex-Cell-O thread grinder, Style 36.

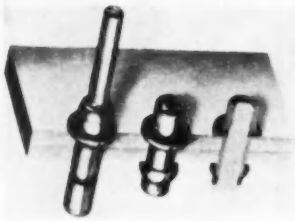
Metal Filling Solder

A use has been developed for aluminum as the principal ingredient in a filling solder. This solder called Fil-Soder is said to take 50 per cent less heat than tin alloy solder and fills without fluxing or shrinking, according to the producer. It is suitable for all metal filling. The solder will stand a 350 deg infra-red bake. It will take any finish, lacquer, or synthetic. *Aluminum Co. of America.*

Circle E-16 on page 65 for more data

NEW PRODUCTS

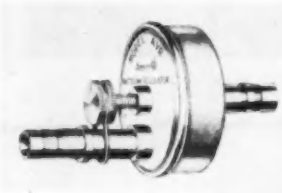
FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65



Blind Lockbolts Have Swaged Lock

Heat treated alloy steel blind fasteners now being offered to the trade have a positive swaged lock. These blind lockbolts have been approved by the military services for use in structures where aluminum alloy blind rivets do not possess sufficient strength. The lockbolts are available in ¼-in. and 5/16-in. diam. The fasteners reduce repair time and maintenance costs. *Huck Mfg. Co.*

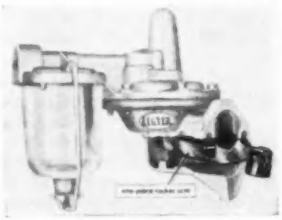
Circle P-5 on page 65 for more data



Windshield Wiper Control Instrument

Now available is a control instrument known as Anco AVR automatic vacuum windshield wiper motor regulator. Installed in the rubber hose vacuum line AVR is said to control wiper motor automatically for safer driving vision. Important features claimed for AVR are that it ends racing of wiper motor and takes out destructive blade whip, also adds up to 30 per cent more blade performance as vacuum weakens. Blades are said to stall later and wiping starts up to 100 yards of car travel quicker after blades may finally stall. Once adjusted for top wiping speed, AVR needs no attention. *Anderson Co.*

Circle P-6 on page 65 for more data

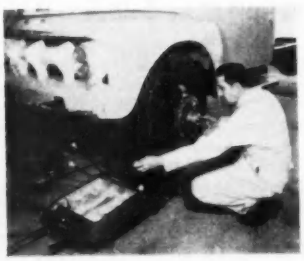


Fuel Pump for Ford Cars and Trucks

Longer fuel pump life and greater operating efficiency are the claims made for an improved fuel pump design. The design is said to aid in faster starting, and eliminate vapor-lock troubles commonly caused by loss of pump stroke.

Outstanding feature of the pump, named the Rockerlink, is a one-piece rocker-arm. This links the action of the push-rod directly to the pump's diaphragm. It is now available for all Ford passenger car and truck applications. *Airtex Automotive Div., Fairfield, Illinois.*

Circle P-7 on page 65 for more data



Wheel Balancing Equipment

Recently introduced is an addition to a line of balancer equipment, the Tune-In wheel balancer with the heavy-duty truck spinner.

The improved model balancer, along with the portable heavy-duty spinner, truck wheel adaptors and accessories, will balance from ½ to 1½ ton truck wheels, as well as passenger car wheels. This universal spinner has two 1½ hp, 6000 rpm, heavy-duty motors which are connected by means of a high speed coupling. The motors are operated by hand levers on both sides of the spinner or by a foot-pedal. Another innovation on this equipment is a quick-action brake operated by a lever on each side of the spinner. *Hunter Engineering Co.*

Circle P-8 on page 65 for more data

Free INFORMATION SERVICE

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FREE LITERATURE

Universal Grinders

Available for distribution is a completely revised edition of a catalog describing 14 in. and 18 in. Type C universal precision grinders. There are 34 illustrations and specifications in this 16-page catalog. *Landis Tool Co.*

Circle L-1 on postcard for free copy

Metal Cleaner for Prepaint

How a new metal cleaner, Oakite Compound No. 31, cleans, derusts and phosphates in a single operation is described in a special brochure that is available. *Oakite Products, Inc.*

Circle L-2 on postcard for free copy

Resistance Welding Equipment

A 48-page illustrated catalog of resistance welding equipment has been recently released. *Multi-Hydromatic Welding and Mfg. Co.*

Circle L-3 on postcard for free copy

Pressure Sensitive Tapes

Two dozen Scotch brand pressure-sensitive tapes that meet various government specifications are described in a new 16-page manual. *Minnesota Mining and Manufacturing Co.*

Circle L-4 on postcard for free copy

Contour Former

Contour formers are fully described in a 32-page illustrated booklet. The booklet shows how flanged parts are formed wrinkle free, how extrusions are contoured to shape without sacrificing any part of the cross section. *Cyril Bath Co.*

Circle L-5 on postcard for free copy

Shell-Molding Evaluation

A five-page brochure has been released which provides information on the evaluation of shell-molding for castings. The equipment and materials required for the process are given. *Borden's Chemical Div.*

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Production Equipment

A complete line of materials handling equipment and production machinery is described in a brochure that is being offered. *Klaas Machine & Mfg. Co.*

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Gear Hobber

A 12-page bulletin (1458-52) describes the new production model 1458-A Michigan Ultra Speed gear hobbing machine. Included in the illustrated bulletin are complete design and operating descriptions, tooling layouts for hydraulic clamping and general machine specifications. A sequence of illustrations shows how the machine hobs the teeth on two 3½ in. diam helical gears with a 1⅝ in. total face width in 58 sec. *Michigan Tool Co.*

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(Please turn page)

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FREE LITERATURE				NEW PRODUCTION & PLANT EQUIPMENT				NEW PRODUCTS			
L-1	L-7	L-13	L-19	E-1	E-7	E-13	E-19	P-1	P-7	P-13	P-19	P-25
L-2	L-8	L-14	L-20	E-2	E-8	E-14	E-20	P-2	P-8	P-14	P-20	P-26
L-3	L-9	L-15	L-21	E-3	E-9	E-15	E-21	P-3	P-9	P-15	P-21	P-27
L-4	L-10	L-16	L-22	E-4	E-10	E-16	E-22	P-4	P-10	P-16	P-22	P-28
L-5	L-11	L-17	L-23	E-5	E-11	E-17	E-23	P-5	P-11	P-17	P-23	P-29
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Roller Chain

A 148-page roller chain engineering data book No. 2457 has just been published. Detailed engineering information covers the selection, installation, lubrication, and maintenance of roller chain for drives and conveyors, and sprocket wheels. For reference and identification, the book contains a large number of photographs and line drawings of the many types and sizes of chain and sprocket wheels available. *Link-Belt Co.*

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Rivets

For the selection of the correct tubular or split rivet for an assembly, a pocket size rivet selector has been prepared. By dialing the selector to any proposed size and type of rivet, it discloses the necessary rivet clinch allowance, the recommended assembly hole diameter and the rivet head diameter. *Chicago Rivet & Machine Co.*

Circle L-10 on postcard for free copy

Iron Castings

A glossary of terms explains over 150 technical terms that are used in common between suppliers and users of ferrous and non-ferrous castings. *International Nickel.*

Circle L-11 on postcard for free copy

Heavy-Duty Cutting Tool

Literature describing the "Hefti-Cut" cutting tool for heavy duty turning, facing, shaping and boring operations is available. Complete line drawings portray the construction and features of the tool and the different models available for different types of work. *DoALL Co.*

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USE THIS POSTCARD

Materials Handling

Booklet #2008-H is designed to explain tramrail overhead materials handling equipment and how it can be applied to bring about one or more of fifteen definite advantages. *Cleveland Crane & Engineering Co.*

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Intercoolers

Supercharger air intercoolers, designed for cooling compressed air between the supercharger blower and the air manifold leading to cylinders of engines—Diesel, natural gas, dual fuel, etc.—are described in Catalog No. 1652, released recently. *Young Radiator Co.*

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"C" Process Described

A description of equipment, materials, and methods of making shell molds using Durez phenolic resins and sand is given in a recently issued pamphlet. *Durez Plastics & Chemicals, Inc.*

Circle L-15 on postcard for free copy

Cleaning and Phosphate Coating Compound

A leaflet describing Detrex 79, a compound used for cleaning and imparting a fine-grained phosphate coating to steel parts to provide a good paint bond, has been issued. *Detrex Corp.*

Circle L-16 on postcard for free copy

Distribution Apparatus

A 100-page catalog, the Distribution Apparatus Digest for 1952, is available. Preceding the catalog section are conversion tables and formulas, approximate discounts, a Quick-Finder index, and a discussion of standardized substations for distribution systems. *Westinghouse Electric Corp.*

Circle L-17 on postcard for free copy

Aircraft Batteries

Now available is a 12 page catalog dealing with Rebat aircraft batteries. It explains construction features with cut-away views or specification charts for the complete line of Flying Rebats. *Reading Batteries, Inc.*

Circle L-18 on postcard for free copy

Fluid Handling

Hydraulic and other fluid-handling applications where aluminum tubed systems can be used to advantage are described and illustrated in bulletin 4316B2. It pictures the twelve aluminum Triple-lok tube fitting shapes now available from standard stock. *Parker Appliance Co.*

Circle L-19 on postcard for free copy

Russian Transport

There is a limited supply of articles, entitled, "Transport-Russia's Achilles Heel?", that provide factual information on the transportation system in Russia. *Automotive Industries.*

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L-2	L-8	L-14	E-2	E-8	E-14	P-2	P-8	P-14
L-3	L-9	L-15	E-3	E-9	E-15	P-3	P-9	P-15
L-4	L-10	L-16	E-4	E-10	E-16	P-4	P-10	P-16
L-5	L-11	L-17	E-5	E-11	E-17	P-5	P-11	P-17
L-6	L-12	L-18	E-6	E-12	E-18	P-6	P-12	P-18
		L-24			E-24			P-24
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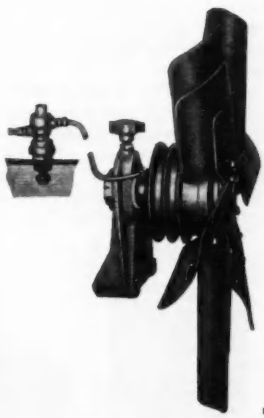

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NEW AIRCRAFT PRODUCTS

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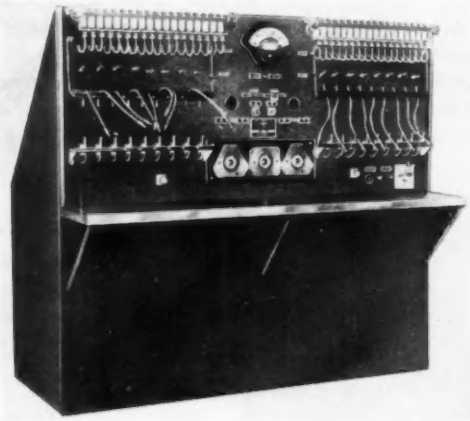
Low Tension System Magneto Test Stand



The Hi-Lo tension magneto test machine, Model MG-2, has been redesigned with a new variable speed drive and incorporated modifications to the test circuit which enable it to test the new R2800 low-tension magneto system. It still provides all of the necessary circuits to test the magnetos and system components previously tested by the earlier models. The drive is said to have better control at "come-in" speed and is variable from 80 to 3600 rpm. (Greer Hydraulics Inc.)

Circle P-1 on page 65 for more data

Motorized Switch

Development has been announced of a motorized switch for interrupting an inductive, high current load to introduce an activating signal in a control circuit.

The motorized switch is a combination of the Moto-Mite, governor controlled if required, a small concentric gear reduction and a single pole double throw switch. Gear trains are available for switch speeds of from 0.6 CPM to 1500 CPM. The governor can control the speed accurately over a wide range of input voltages. The actual size is 4½ in. by 1⅝ in., including governor for an 800 CPM unit. The weight is approximately 9 ounces. The motor voltage ranges from six to 90. The motor switch features heavy duty tungsten contacts, wiping action on contacts and positive make and break of contacts. *Globe Industries, Inc.*

Globe motorized switch.

Circle P-2 on page 65 for more data

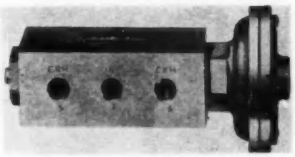
Diaphragm Valve

A diaphragm operated spring return single plunger valve for use when only low pressure air is available for the pilot control is being placed on the market. These valves can be operated with instrument air at pressures of from 12 to 35 psi on the diaphragm.

The valves feature a stainless steel hollow plunger with radial ports. The spring return is placed under the diaphragm push plate permitting open end exhaust if desired.

Furnished tapped for either ⅛ in. or ¼ in. pipe connection, in two-way; three-way; double two-way; four-way; and five-way designs for use with air, oil or water at line pressures up to 125 psi—also vacuum—at temperatures not exceeding 150 F. *C. B. Hunt & Son, Inc.*

Circle P-3 on page 65 for more data

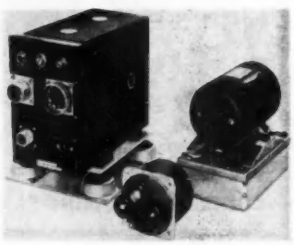


Hunt diaphragm valve.

Beacon Receiver

Designed and manufactured to provide a lightweight aircraft marker beacon receiver is the MB-3 receiver. MB-3 is a complete aircraft marker receiver for detection of either tone or voice-modulated 75 mc signals through aural and visual indications for each of the three identifying modulation tones of 3000, 1300 or 400 cps. The MB-3 is adaptable to 12 or 24 v systems and gives equal performance with any of the popular types of antennas. Nominal impedance of 50 OHMS is the only requirement. The MB-3 weighs slightly over 7 lb. *Flite-Tronics, Inc.*

Circle P-4 on page 65 for more data



Flite-Tronics aircraft marker beacon receiver, MB-3.

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Here's the eye-opening fact: Now 25 out of 27 leading engine manufacturers using chrome rings specify **Perfect Circle**

The Standard of Comparison

The application of solid chrome to piston rings, as perfected by Perfect Circle, more than doubles the life of pistons, cylinders and rings. Performance data will be furnished on request. Write Perfect Circle Corporation, Hagerstown, Indiana. The Perfect Circle Co., Ltd., Toronto, Ontario, Canada.

METALS

All Metal Industries Are Affected by Steel Strike. Advance in Price of Tin Unlikely as Stocks Increase.

By William F. Boericke

Effects of Steel Strike

The creeping paralysis of industry that followed the steel strike, marked by cutbacks and shutdowns in the automobile business, furloughs of railroad workers, declines in coal output, extended to other metals in July. Zinc, handmaiden of steel, was particularly hard hit. June statistics can scarcely fail to show a sharp decline in deliveries and a heavy increase in producer stocks. Copper demand was expected to be less because manufacturers of consumer goods were unable to get steel to use with copper. Tin was easier for the same reason. A real shortage of tin plate appears just around the corner. Lead demand was less directly affected as battery manufacturers started to buy more liberally. Manganese ore prices have eased because important buyers in the steel industry are on the sidelines until production is resumed. There is less demand for tungsten ore and domestic miners are thankful for Government price support.

With the ending of the steel strike there is little question that more controls will be imposed on steel production and distribution. Lifting of controls was confidently expected before the end of the year but an estimated loss of over 13 million tons of steel up to the middle of July has shoved the decontrol date well into 1953, perhaps to mid-summer. For the second half of 1952 the shortage of steel will be real and Government planners are frankly in a dither on how to deal with it. Probably top priority will be given to military, atomic, and machine tool orders.

Until the second week in July, most steel users were able to get along by living off their inventories. For most manufacturers that expedient is gone. Steel bars and plates, scarce items, even before the strike, were hardest to buy. Foreign steel could be had, but at a price that domestic users hesitated to pay. Yet steel importers reported a sharp increase in demand in July. Prices were $50-60 per ton more than domestic steel cost before the strike.

Steel scrap continued to pile up while the strike was on. Dealers' yards are reported well filled. The big drive put on earlier in the year to collect all scrap possible was responsible for increased supplies. It is doubtful if the price of steel scrap, now quoted well below the ceiling, will recover this year.

However, 1953 may be a different story. at any rate during the first quarter. The sympathetic walkout of the iron ore miners to support the steel strike means less pig iron can be produced. It is calculated that 13 million tons of ore were lost by the first week in July, of which about half would have gone to the stockpile to be used when winter prevented further shipments by Lake ore carriers. Without pig iron, the steel mills will be forced to rely to a greater extent on scrap to maintain operations and scrap may once again be a scarce item.

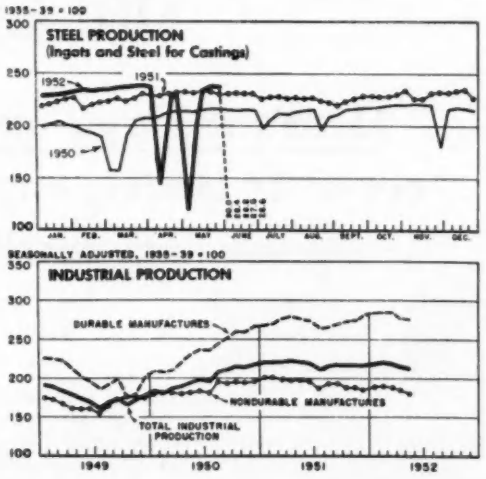
Labor Troubles Confront Copper Producers

Copper consumption moderated in July, in part because of the steel strike but principally because of mass vacations at principal fabricating plants in Connecticut. Nevertheless, demand for the metal was good. Consumers were concerned over the possibility that labor troubles might develop at the copper plants that would cause loss of domestic production. Concerted action of the union will probably await the outcome of the steel strike and is likely to follow the same general pattern.

Domestic copper consumers continue to receive, under allotment, 60 per cent domestic metal, 40 per cent foreign, for which they can pay any price agreed upon. The foreign price early in July was fairly steady between 32 and 36 cents per lb, with a

(*Turn to page 98, please*)

Selected Business Indicators



Source: U. S. Dept. of Commerce

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Maybe it's a crankshaft or an armature . . . perhaps a fan or a belt pulley. No matter. The important thing is this: If it isn't *balanced,* it isn't ready for service.

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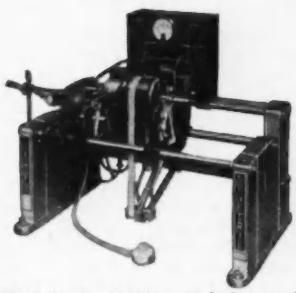

Gisholt Balancing Machines, made in a variety of sizes and types, can also be furnished with correction equipment designed to meet your specific requirements.

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Observations

By Joseph Geschelin

Engine Progress

The continuing bottleneck in machine tool deliveries still controls the number of new engines to be introduced for 1953 automobiles. We know definitely that Dodge will have its new V-8 ready for the 1953 announcement. We also understand that Buick will have a big V-8 for its Roadmaster. It is quite likely that smaller output prototypes of the same engine will be introduced for the other Buick models in the line later on. We are still awaiting some news of the emergence of the Mercury V-8 which will be built in the Ford Cleveland plant. It now appears that a Pontiac V-8 will be delayed until machine tools are readily available.

Machinery Bottleneck

The machine tool bottleneck is right in the lap of those who run the show in Washington. As things are shaping up, the reduction in delivery schedules for military projects has resulted in crowding machine tool order boards with equipment which may not be needed for some years to come. A small sampling indicates that a great deal of machinery already is on hand, some of it awaiting installation. Moreover, if two-shift or three-shift operations were to be practiced, some projects could be carried on without adding new machines and without pre-empting additional scarce manufacturing space. If it is equally true that considerable machinery is being shifted to warehouses, then it is obvious that some relief is in order from the stranglehold on machine tool order boards. Prompt action now is needed. If it is possible to carry the current military programs with available equipment or with such machinery as could be completed within a reasonable time, the civilian economy could carry on without jeopardy.

Compression Or Expansion

A Diesel expert has written us to say that in his opinion thermal efficiency is a function of expansion ratio rather than compression ratio. His thesis is that a spark-ignition engine can be built with but moderate compression ratio and 12 to 1 expansion ratio. Then by supercharging, he claims that output per cu in would be more than 50 per cent greater than in the best engines of today. Furthermore he believes that thermal efficiency would be equal to that of the Diesel cycle over a wide range of loads. This suggestion reminds us of the discussions some years back regarding development of small engines fitted with superchargers. We find that considerable study has been given to these questions in recent years. It is the opinion of some well-informed people that from the standpoint of cost economy, i.e., initial manufacturing cost, it is cheaper to build a big engine than to install a supercharger.

Cold Extruded

Cold extrusions, forgings or tubular parts forged or pressed from suitable slugs, provide an economical means of making a large variety of parts quickly and with minimum consumption of valuable materials. Too the current techniques make it possible to reduce metal removal to the very minimum. Actually, many production applications already are in use, much of these for military parts. It would seem to be in the interest of the general good if more publicity were permitted on these applications so as to spread the usage of the technique more widely. It is no longer true that there is some mystery surrounding the method. We are quite certain that contact with heavy press equipment manufacturers such as National Machinery, Ajax, HPM, or Lake Erie would pave the way to the solution of specific problems.

Printed Circuits

The dramatic appeal of a new engineering concept—the printed circuit—has been emphasized by the fact that the photocell element of the Autronic eye contains one of these circuits. In this instance, instead of being a conducting circuit or wiring diagram, it serves to eliminate conventional resistors. The printed circuit has many advantages as demonstrated in its utilization in military electronic devices — radio, walkie-talkie, etc. It promotes miniaturization, reduces the weight of the package, reduces assembly costs, and in general is a device for cost-reduction. To what extent printed circuits can be adapted for automotive use is a matter for speculation at the present time.

Safety Features

To our way of thinking the automobile producers have made enormous strides in providing safety. Generous glass areas provide ample seeing in all directions, and the trend to lower and shorter hoods on current models has given excellent visibility directly in front of the car. Nevertheless, some still believe that only a rear engine design will give the ultimate in safety and visibility. Most of automotive designers will challenge this statement. In the first place, the plus merits of rear engine drive are outweighed by some major disadvantages. Moreover the public has grown to demand large luggage compartments. If the engine is housed in the rear, the luggage compartment must be moved to the front to house the spare tire as well. Net result would be a front compartment about the size of the present hood, and we would be right back where we started.

Vacuum Testing

One of the fast growing techniques in industry circles is the vacuum testing of parts such as cylinder blocks, cylinder heads, oil pans, transmission cases and other components which must be leak-proof. The water test, commonly employed, is not foolproof, is time-consuming and is expensive in that it delays movement of parts to assembly lines. Vacuum

(*Turn to page 90, please*)

STERLING
PISTONS

Contributing to Better Engine Performance for Over 30 Years

Sterling Engineers will work with you as they have with other leading manufacturers in developing pistons to meet your exacting requirements. Write or phone.

Patton 48 Tank Features Revealed

THE veil of secrecy was lifted last month on the new Patton 48 medium tank with the official opening of the Chrysler Delaware Tank Plant. This plant was described in the December 15, 1951, and April 15, 1952, issues of AUTOMOTIVE INDUSTRIES.

Having a one piece cast hull of elliptical configuration and a one piece cast turret, the 810-hp tank weighs approximately 45 to 50 tons. It is equipped with the new cross-drive transmission and power steering. A simplified and more effective hydraulic turret control mechanism also has been provided. Greater flotation in muddy terrain is claimed for the tank due to its wider tracks which provide lower ground pressures per unit area than its predecessors. A T-41 range finder, manufactured by the Chrysler Airtemp Div., is used in conjunction with the tank's 90 mm, muzzle brake equipped main gun. The 810-hp Ordnance-Continental V-12 aircooled engine is being manufactured by the Chrysler Tank Engine Div. in New Orleans, La.

• • •

Quality Control in A Large Body Plant

By EARL C. BLAINE

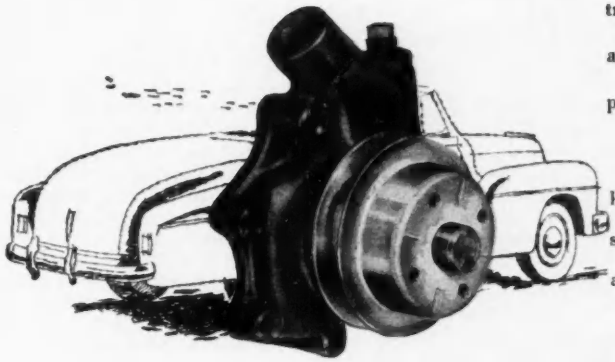
Plant Manager, Hunting Park Plant, The Budd Co.

NOWHERE has quality control had a better proving ground than in the automobile industry; the very chronicle of its growth bears out this statement. There have been vast developments in many other fields, naturally, but those of us connected with this amazing industry modestly contend that it "continues to lead the world in production know-how, and that it has the resources to test any new tool, machine, method or idea, for it deals in production quantities that justify large scale mass production, research and ingenuity.

Quality control does not begin, as management sometimes seems to think, as the last thing before shipping. It should start on the drafting board. As soon as finished, every part detailed by a draftsman should be examined by someone with shop experience. Right here, standards of dimensions and tolerances should be established. If there are any unanswered questions, the designing engineers should be called in. The more detailed the work, the more complicated the part, the more the discussion should cover. Engineers and manufacturing groups should agree, not only on dimensions and tolerances, but on which way the tolerances can go—plus or minus. When a decision is reached, a note of this decision should be included in the drawing.

This closely knit coordination of engineering, drafting and manufacturing try-out departments brings the desired result as soon as everyone gets the idea that detailed work in all

(*Turn to page 92, please*)



PUMPS for the cooling systems of cars, trucks, buses and tractors or pumps for grinding and cutting machines are engineered and precision built by Thompson.

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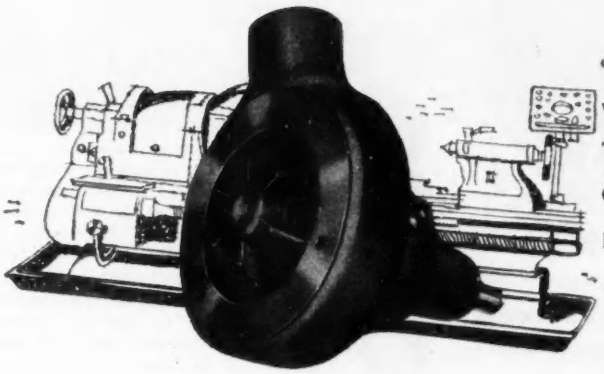
This means that every Thompson pump assures maximum performance and dependability.

If you need pumps to keep your product cooled or pumps to cool your engines, write or phone Special Products Division, Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland 3, Ohio. You'll soon learn what leading manufacturers have known for 50 years —*you can count on Thompson.*



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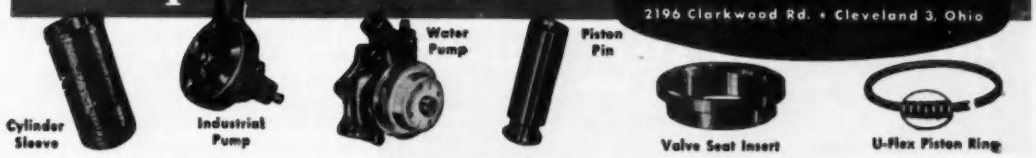

Great Fuel Savings Possible With Ideal Engine-Transmission

(*Continued from page* 46)

of a combined engine-transmission system in one package.

While it is difficult to assign firm values to the possible gains without the benefit of actual tests, it is believed to be entirely justifiable to predict a future overall saving of 25 to 35 per cent in the nation's fuel bill by transmission developments. This is about half of the theoretical gains shown in the theoretical analysis made at road load.

It is realized, of course, that this improvement must be achieved without sacrificing the pleasing characteristics which make present automatic transmissions so popular. In fact, the so-called pleasability will be greatly improved with the ideal transmission in combination with engines up to modern standards of noise and smoothness. The power-transmission package would bring customers a new concept in motoring pleasure and economy.

One reason it is so difficult to foresee all the gains resulting from an ideal power-transmission system is that it so completely changes the nature of both engine and transmission.

The engine, for instance, would seldom operate much under 70 to 80 per cent of its full power output. One of the car manufacturer's biggest headaches results from operation by some drivers at very light loads. One of the principal causes of spark plug fouling is light load operation. There is also a good possibility that elimination of light load operation would reduce octane depreciation from deposit build-up because a good share of combustion chamber deposits, particularly those which are likely to cause pre-ignition and wild ping, are accumulated during light load running. Anything which will reduce combustion chamber deposits will result in creating mechanical octane numbers or, in this instance, transmission octane numbers. The fact that, in the low speed range where knock is critical, the engine would not be permitted to operate at full power, might contribute somewhat to its mechanical octane numbers.

It is unlikely that an engine operating near its full power output at all speeds would need a vacuum spark advance. The vacuum spark advance or its equivalent is employed on most engines because of the slow-burning light load mixtures. Elimination of the vacuum spark advance would be a welcome simplification.

Engine valve timing requirements would need to be carefully investigated under the new operating conditions of the ideal transmission to provide good high speed breathing together with solid low speed performance.

An ideal transmission might also simplify carburetion because of the near full throttle operation. Operation at low vacuum might improve oil control and influence the deposit accumulation picture because less oil would get into the combustion chamber. In other words, the development of a commercial ideal transmission

(*Turn to page* 78, *please*)

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AND OTHER BALL APPLICATIONS

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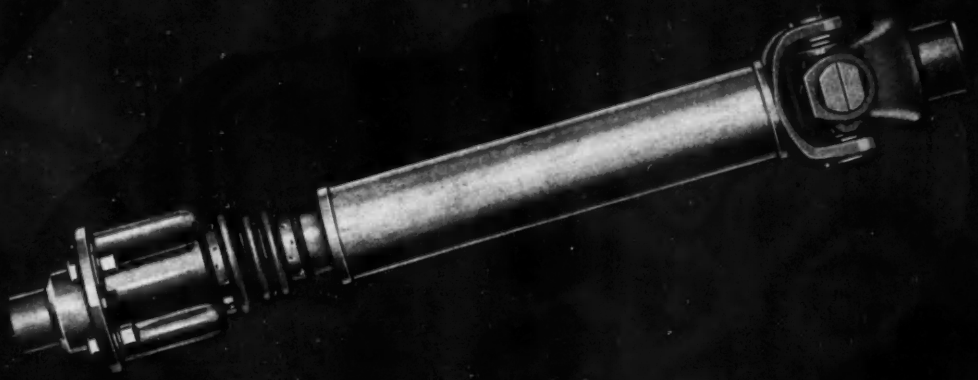
Eliminate Spline Friction



with "DETROIT'S" Exclusive Universal Joint Combinations

A smoother car ride and longer drive train life are assured by "DETROIT'S" exclusive universal joint combinations. This is accomplished because slip motion, angular motion and length changes are permitted with no spline friction. Thus the thrust load on transmission and axle bearings is reduced to an absolute minimum.

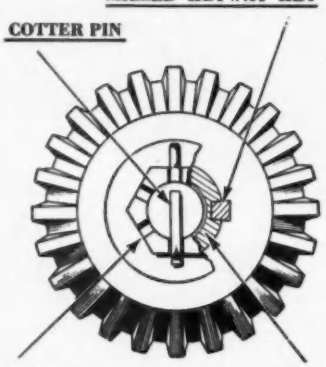
Detroit **UNIVERSAL JOINTS**

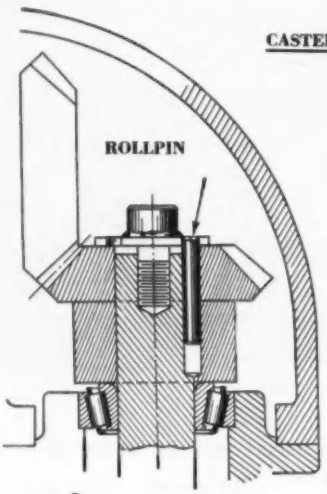
UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

Fastener Problem of the Month

Transmission of torque from shaft to gear **August 1952**

PROBLEM: Belsaw Machinery Company, Kansas City, Mo., manufacturing light sawmills and woodworking machinery, formerly used this method to lock Timken bearings and to transmit torque from a shaft to a bevel gear. A key, broach gear key seat and a milled keyway in each shaft were required. Removal of the gear was difficult. Belsaw engineers, feeling that this assembly was too costly, developed a new fastening method.





SOLUTION: An ESNA Rollpin—the slotted tubular steel cylinder with chamfered ends—provided a method that resulted in a saving of more than 60%. A socket head cap screw welded to the plate, holds the bevel gear to the shaft. The Rollpin, simply driven into an extra-depth production-drilled hole, locks the bearing adjuster screw and serves as a key in transmitting torque from shaft to gear. It locks itself in place through the constant pressure it exerts against the hole walls. Removal is easy—Rollpin is simply punched deeper, permitting the gear to be pulled from the shaft. As the gear is pulled, the Rollpin falls out.

ESNA can probably provide a sound, economical answer to your next fastening problem. Mail our coupon for design information on Rollpin and other self-locking ESNA fasteners.

ROLLPIN TRADE MARK

Dept. R10-85, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey
Please send me the following free information:
.... Rollpin bulletin .... Here is a drawing of our product.
.... AN-ESNA conversion chart What fastener do you suggest?
Name ..... Title .....
Firm .....
Street .....
City ..... Zone .... State .....

(*Continued from page 76*)

would open up a whole new field of engine development.

Up to the present time, automatic transmissions have generally been developed with the object of eliminating the clutch pedal and thereby making driving easier and more pleasant. The use of the ideal transmission-engine combination would add the incentive of much improved efficiency without sacrificing other desirable features in any way.

A summary of the gains in economy which are possible with a combination of high compression engines and ideal transmissions, shows the incentive for further intensive work. This article has shown how a gain of from 25 to 35 per cent is easily possible with an ideal transmission. It has been shown that large gains of 25 to 35 per cent are possible with engines of 12:1 compression ratio. By obtaining the advantage of gains from both high compression engine and ideal transmission developments through further research, a total saving of 45 to 60 per cent could be made.

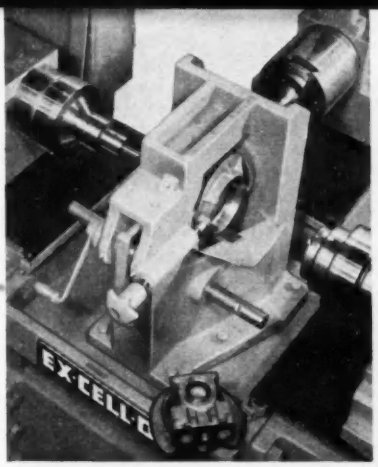
It seems entirely possible, therefore, to reduce our gasoline consumption by half without a sacrifice in car size, performance or roominess. To obtain a 50 per cent increase in the present miles per gallon with normal driving is indeed an incentive for automotive engineers to take advantage of the potentials in the high compression engine and the ideal transmission.

Our progressive industry has always had a goal in the future, set by the research of today. This study presents such a goal as a challenge for future development.

When the goal is reached motorists will go half again as far on a tank of gasoline. This will permit our valuable oil resources to be used more effectively and more efficiently. If oil wells are considered sources of miles of transportation, each well will produce 50 per cent more than the present mileage. Where we now speak of 20 miles per gallon in the family car, we will be able to boast of 30. The savings, made up of the total of each motorist, will reach into the billions of dollars per year.

As automotive engineers, we will have performed one of the basic jobs of engineering—to make the most efficient use of our natural resources.

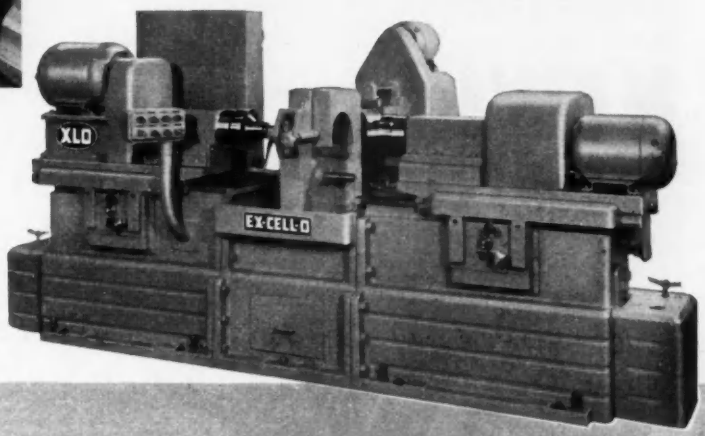
The preceding article is from a paper presented by the authors at the SAE Summer Meeting held recently in Atlantic City.



Close-up view shows relatively simple tooling.

Combine Operations

FOR PRECISION



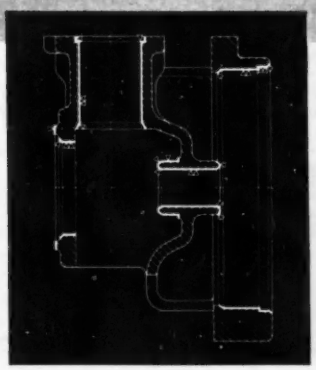
Ex-Cell-O Three-Way Precision Boring Machine.

COMBINING OPERATIONS CUTS COSTS, BOOSTS OUTPUT, PROMOTES ACCURACY

Once a part is properly located and clamped it's good practice to do as much machining on it as possible before it's moved. In this way the various operations can be held in accurate relationship to one another, production is increased, and handling time is minimized.

In machining this cast-iron refrigeration crankcase, five roughing and eighteen finishing operations are held in accurate relationship to one another, with extremely close tolerances on the crankshaft and cylinder bores. Net production for the roughing operation is 33 parts per hour; for finishing, 36 parts per hour.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines, or write today for Bulletin 31631.



Sectional view with heavy lines to show operations. Single and double triangles indicate, respectively, single operation and rough-and-finish operations.

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52-18

Where Weldments Reduce Scrap Losses

(*Continued from page 56*)

reduced welding cost, however, total cost per piece averages lower than for the machined castings.

Fig. 1 shows the weldment that replaces the cast steel planet carrier. Hollow wrought steel stub shafts are joined to circular plates by circular fillet welds. Short strips set to form T-sections space the plates correctly and are welded to the plates. This leaves room for planet pinions between spacers. Material plus welding labor, by hand method, slightly exceeds the cost of the rough casting but machining cost is 40 per cent lower. This is partly because nearly half of the castings supplied before had to be scrapped after machining revealed flaws not economically repairable by welding.

In Fig. 2 is shown the weldment that takes the place of the cast steel drive housing. In the casting, the spool-like portion was joined to the bottom flange by a single flanged web, while in the weldment, two hot-dished, U-shaped plates continue down to the triangular flange to which they are joined by arc welding. Between the two plates is welded a plate that is formed to an approximate cylinder that is bent to form a notch at one point and is left open near the bottom. There, the open ends are welded to a sleeve bored out to fit the drive shaft bearings. The formed plate also is joined to the dished plates at each side by fillet welds through nearly complete circumferences.

This construction provides an exceedingly strong and rigid structure. It weighs five lb more than the casting it supersedes but costs slightly less even with hand welding. A further reduction in cost will result, however, when semi-automatic welding is applied.

For the clutch drum, a cast Mehanite ring is retained, Fig. 3, because the cast metal provides a better and more wear resistant braking surface than welded steel offers. The web or flange, however, is dished (hot-pressed) mild steel to which a steel hub is welded. It affords higher strength than for the casting now displaced. Material cost for the combined weldment and cast ring is about half that for the all-cast part but hand welding brings total cost to about 12 per cent below the former casting. This cost will be lowered by semi-automatic welding. As the casting and parts of the weldment have to be machined, machining cost is the same as for the casting, but the latter weighs 112 lb as against 105 lb for the present combined structure.

Two dished flanges are employed for the cable drum. They are hot formed inwardly to fit over a ring hub and at the same time, the disks are embossed to form radial stiffening ribs. Subsequently, the inner ends of the disk hubs are joined by a circumferential arc weld and a similar weld joins the hub ring to one flange.

Another and larger steel ring is later arc welded to the outer face of the other flange but, before this is done, two sections are flame cut from the flange hub at opposite sides of the bore and stampings of angle-shaped section are fastened by arc welds around their contour. The stampings then form recesses in which the ends of cables to be wound on the drum are locked below hub diameter. This leaves a cylindrical surface on which the cable winds.

As a weldment, the cable drum weighs 175 lb as against 208 lb for the cast drum. Material cost for the

NEW! MITCHELL IGNITION SWITCH

Cutaway view of new Mitchell ignition switch showing die cast detent path and operating mechanism.

with Superior Detent Action

United Specialties' Mitchell Division, pioneer of the starter-type ignition switch combining starter circuit and ignition switch functions, now offers a new, improved starter-ignition switch. Check these advantages:

1. Positive, smooth, far superior detent action.
2. Extra long life.
3. Simplicity of design — only a minimum of parts.
4. High electrical capacity — a "must" with today's accessory-loaded cars.
5. Built to withstand the effects of dust and moisture.

Your inquiries about this new ignition switch or about Mitchell's turn signal switches and complete line of rolled shapes will receive prompt attention.

UNITED SPECIALTIES COMPANY

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IGNITION AND TURN SIGNAL SWITCHES • ROLLED SHAPES • DOVETAILS

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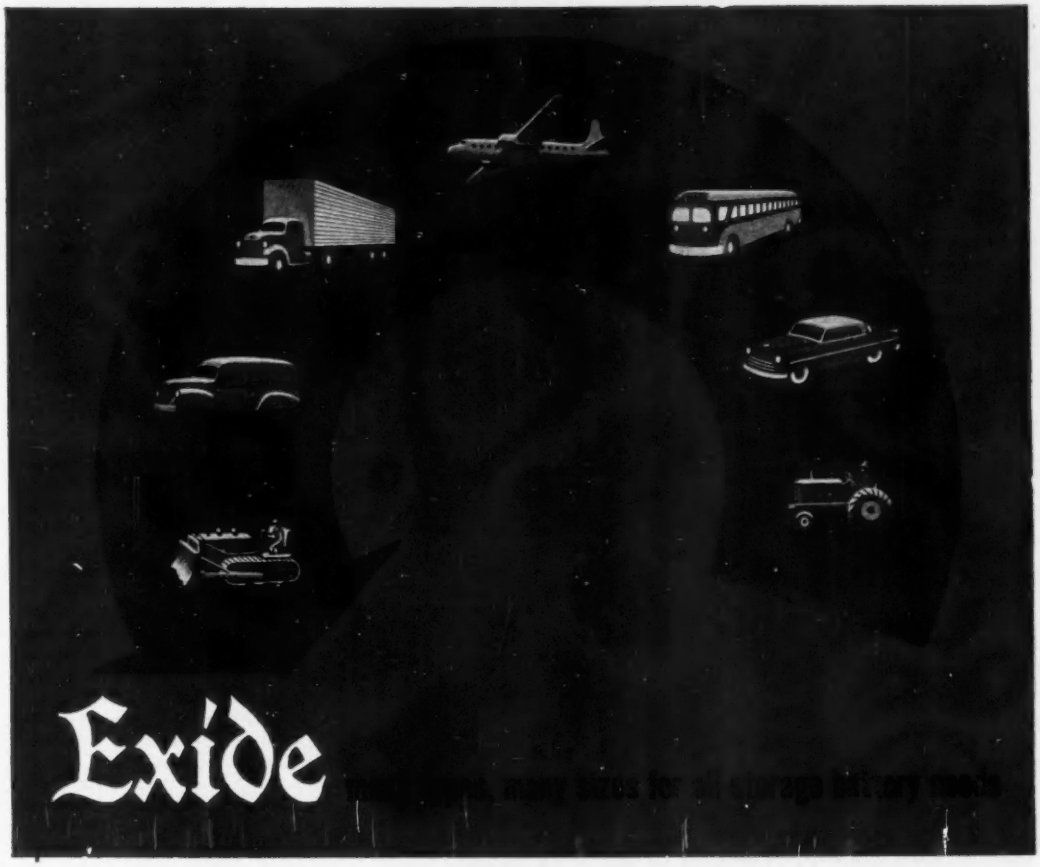

Whether your product is gas- or diesel-powered, there's an Exide Battery to fit your specific requirements. For the Exide range of types, sizes and capacities cover all storage battery needs of automobiles, trucks, tractors, off-the-highway equipment, aircraft, motor boats.

All are factory-fresh, assured by prompt deliveries from the many Exide manufacturing and assembly plants located throughout the country.

Years of research-engineering are back of Exide Batteries. This development goes on and on, for Exide advances keep pace with current needs, providing batteries you can count on for dependable performance, long life and low cost per mile of operation.

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for light, medium or heavy-duty service

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How to BOOST OUTPUT of OLD Screw Machines

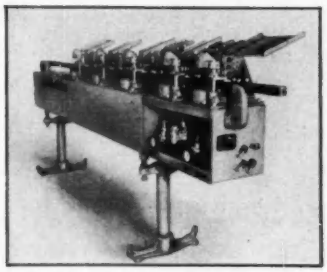
Lipe Automatic Magazine–Loading Bar Feeds boost output 30% and more on 15 to 30-year old B&S's!

This battery of 25-year old screw machines received a production "shot in the arm" when equipped with Lipe AML Bar Feeds.

Lipe's AML Bar Feed greatly speeds-up stock feeding. Enables a screw machine to produce 90% or more of its gross geared production capacity. Increases output at least 30%—in many instances better than 100%!

Makes feed fingers obsolete

Lipe's AML Bar Feed is actuated by a pneumatic control system of valves and cylinders. Stock is fed through the collet by a pusher rod at the *end* of the bar. There is no other point of contact. This method of feeding does away with feed fingers . . . abolishes multiple feed finger feedouts . . . eliminates scratching and marring of high-finish stock . . . reduces scrap and rejects.



Lipe AML Bar Feeds help overcome new equipment shortages . . . cut cycle time, increase actual gross of older machines.

Load it . . . forget it

Magazine holds a normal 8-hour day run of stock. Capacity ranges from 19—5/8" to 96—1/8" bars. Loading and feeding are automatic. Stock is fed continuously . . . there's no idle operation—no "cutting air." Operators are relieved of repetitious stock bar handling . . . can attend a greater number of machines.

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B&S No. 00 Spindle Bore 9/16"
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B&S No. 0 Spindle Bore 7/8"
B&S No. 0 Spindle Bore 1"

Other Lipe Pneumatic Bar Feeds available for other screw machines, automatic or hand, handling from 1/8" to 2 1/2" diameters.

Convert your old screw machines into modern, high-production equipment . . . economically! Let our engineers show you how. No obligation. Write **Lipe-Rollway Corporation, Syracuse 1, N.Y.**

latter was nearly twice that for the weldments but hand welding labor, which will be reduced by about one-third when the semi-automatic type is introduced, brought costs to a level about 10 per cent below that for the casting.

Machining on cable drum weldments costs about 75 cents more than for the casting but the total cost of the weldment is still below that of the casting and the weldment is superior to the casting on all scores.

Setup for Buick Hood Production

(*Continued from page* 49)

hoods and, at each forward motion (once the conveyor is filled) a hood is moved off its discharge end and onto a loader for the third press, as shown in Fig. 4.

This air-operated rockover rocks the load into the third press die that preforms a second trim and a pierce operation. These are done in the first of two dies in this press. Then the hood is hand shifted into the second die in the same press, which is an expanding die that sets the hood-fender line and then is collapsed by air actuation to permit removal of the hood.

Hand unloading is done from this press and hand transfers continue through the subsequent press operations. But the foregoing mechanical handling permits transferring to other duties the four men formerly needed for handling between the first and second, and between the second and third presses, amply warranting the investment in new handling equipment.

Subsequent operations on the hood are of a relatively minor nature, though essential in completing the hood and include such operations as setting flanges and piercing, done in smaller Verson presses. The final Warco press flanges the nose of the hood and perforates a monogram hole, and the hood then passes through a toggle air-operated die (needing no press) that forms a cowl flange.

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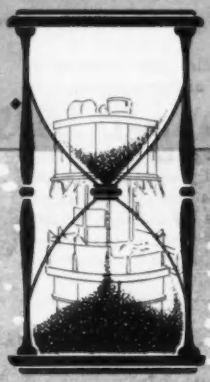
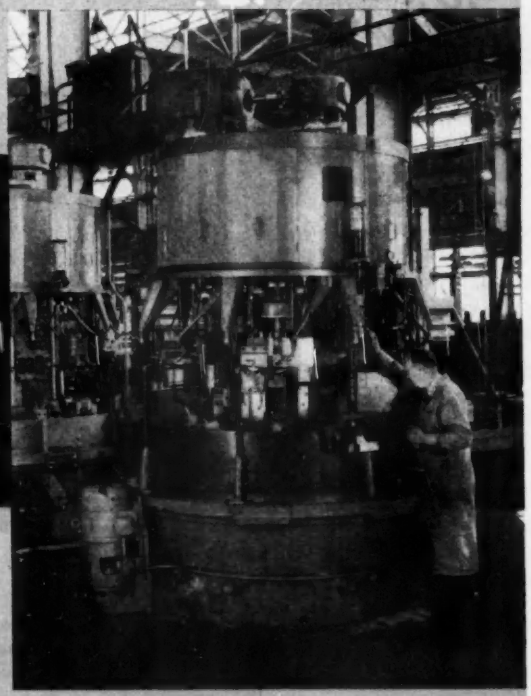
MANUFACTURING

Sands of Time . . .



As the Hour glass accounted for the passing of time the Bullard Mult-Au-Matics have, in many plants, established manufacturing time schedules with an attendant record for time savings.



Whatever the pace, there is always manufacturing economy and efficiency in the Mult-Au-Matic Method.

Whether it is the keyed up pace for Defense or War or the milder pace of peacetime production, Mult-Au-Matics can be adapted to the requirements of the moment.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Honeycomb Panel Construction

(*Continued from page 53*)

cal characteristics are obtained by good insulation and appearance.

Cost of Labor

The unit cost of the labor on military lightweight trailers using panels of honeycomb structure can be expected to be less than that of a frame type structure of equivalent characteristics, provided that the honeycomb panels are kept relatively simple and large. This remains to be proven by mass production cost figures but this probable result stems from a substantial saving possible in final assembly time.

Manufacturing Equipment Requirements

While the equipment neded to manufacture honeycomb panels is not particularly complicated or expensive, still it has only recently become available in sizes suitable to produce panels large enough to take advantage of its inherent simplicity. This has meant that conventional frame construction could be built in more industrial plants at more competitive prices where high priority items were not already in production. Now that the advantages of honeycomb panels have been proven, however, these facilities are being expanded to do the job and will do it at a reasonable cost.

Ability to Seal

Where tropical storm, flotation and stream fording requirements call for tight sealing of structural seams, honeycomb panel construction surpasses conventional frame construction because fewer rivets, bolts and seams are required to be sealed.

Durability and Ease of Repair

When conventional sheet metal and frame construction is damaged in the field by collision or flying fragments, it is expected that the sheet and frame materials will become dented and twisted and bent. Honeycomb panel construction is probably no more resistant to such damage, but when it does occur the surface materials remain straight and supported at the edges so that a repair may be made on the flat surface by simple flat patches using sheet metal screws or blind rivets.

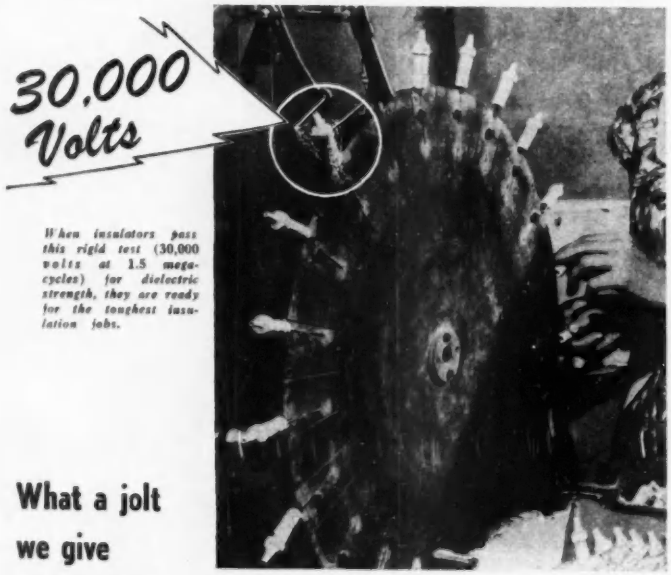
Interior and Exterior Neatness

Honeycomb panel construction with sheet metal surfaces, on a military lightweight van trailer body provides a smooth wrinkle-free solid feel and appearance to both interior and exterior surfaces.

Ease of Assembly

With honeycomb panel construction each panel is an individually sealed and complete component of subassembly. Conventional frame construction, therefore, will usually take longer in final assembly, a time when space and production line time is more costly. Honeycomb panel construction is also particularly suitable to use in trailer designs where a portion or all the structure must be knocked down for transportation in relatively smaller pieces such as is the case with the universally used GCA van trailers originally developed for the U. S. Air Force.

The preceding article is from a paper presented by the authors at the A.S.M.E. Spring Meeting in Seattle, Wash.



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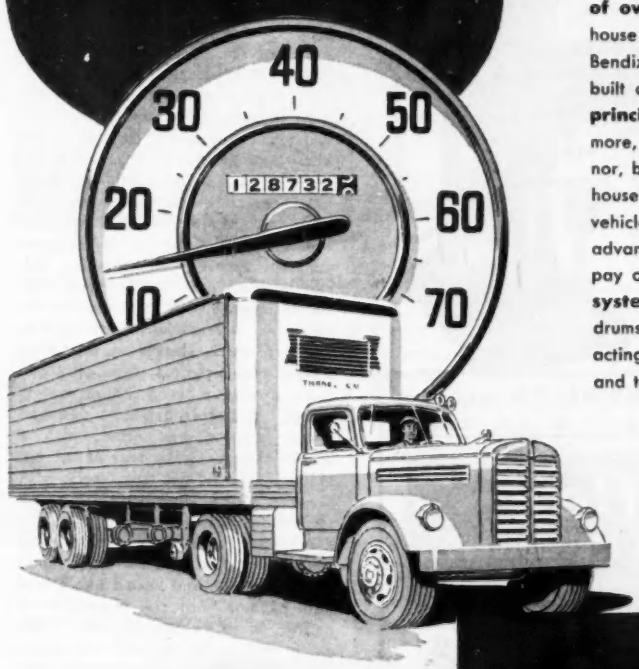

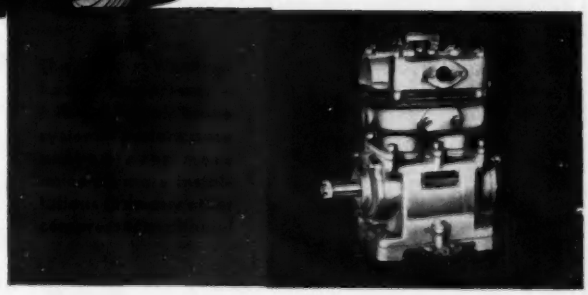

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- ★ Power Index, utilizing Geneva Mechanism
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- ★ Table work surface—17"x33"
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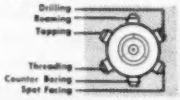
- ★ Extremely close tolerance can be held



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Le Mans Race

(*Continued from page* 32)

the finest sports cars ever carried across the Atlantic. Using a modification of the eight-cylinder Chrysler Fire Power engine, he claimed to have 299 hp, whereas few of the European claims went beyond 200 hp, but his cars were not the fastest and held the lead for only a short time at the beginning of the race. One Cunningham buried itself in the sand, but was extricated with a loss of 90 minutes, and two engines apparently developed valve trouble. One of the Nash-Healeys was fitted with a special light-alloy head of English design. Defects developed and it did not go the distance.

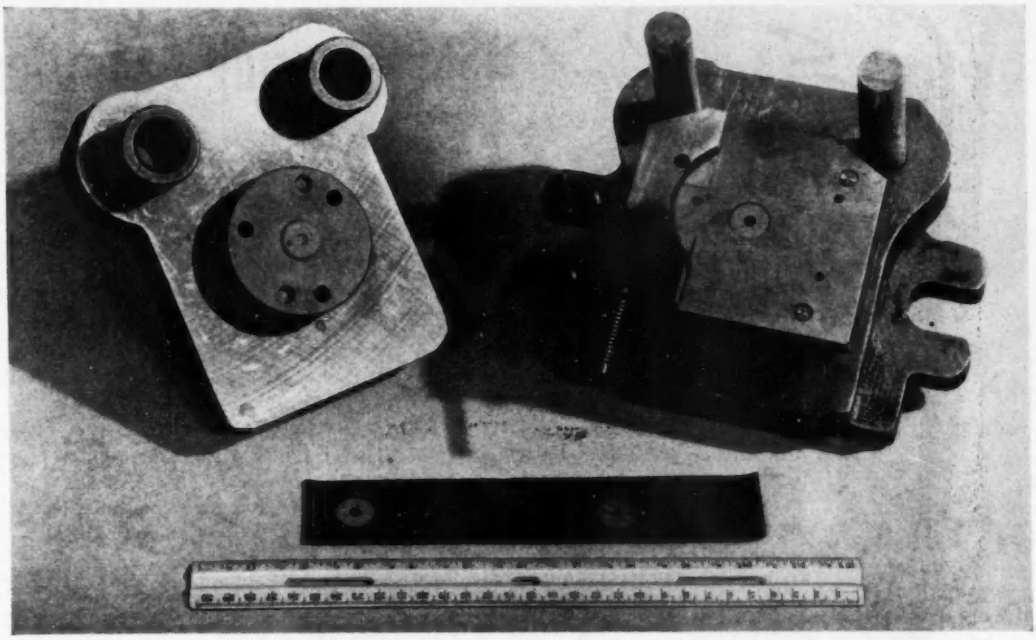
The two British Allard cars had Chrysler Fire Power engines, as obtained from the factory, but both cars failed to finish. One either broke an axle shaft or had defective transmission. The other was reported to have had lubrication trouble.

A feature of this race was the high degree of perfection of the details and accessories which a few years ago gave a lot of trouble and revealed basic defects. Lighting equipment, batteries, starting motors, ignition, carburetors, oil and gasoline tubing, and body details, were responsible for very few withdrawals. This can be attributed to the very tight regulations on what were once looked upon as accessories. The British Jaguars which started as favorites, having won last year, were all eliminated through a faulty cooling system layout. To reduce height, a new and lower radiator was fitted, with a header tank near the rear of the engine. Water did not flow freely, with the result that overheating warped the cylinder blocks.

A six-cylinder Talbot which had broken last year's record one hour before the end, and looked like a certain winner, with the nearest competitor 40 miles behind, was eliminated with a burned-out connecting rod bearing. There were several other cases of connecting rod failures. All six Ferraris, which on more than one occasion broke the lap record with 107.5 mph, suffered from two much power in relation to clutches and transmissions. Practically all went out with one or another of these failures. A Gordini, a newcomer and one of the fastest, was eliminated by its brakes. Despite all the experimental work, brakes are still a weak point. Attention has been given to the cool-

(*Turn to page* 90, *please*)

Graph-Mo® steel dies produce up to 80,000 parts without throwing burrs!



THE Reliable Tool and Die Company, Cleveland, Ohio, was having trouble with the chromium and carbon dies it used in making small, intricate gears and parts for electric motors and toy mechanical winding motors.

The dies were throwing burrs. The parts often tore when broached. Gear teeth spalled in the dies. And die life was short due to chipping of the cutting edges.

Then Reliable's engineers tried Graph-Mo®, one of four Timken® graphitic tool steels. The Graph-Mo blanking dies produced as many as 80,000 parts without a single burr. Because of free graphite in its structure, Graph-Mo has outstanding low-friction properties: minimum tendency to scuff, seize, score or gall. Tearing and spalling were eliminated. And the cutting edges stayed sharp and true because the diamond-hard carbides in Graph-Mo give excellent resistance to wear and abrasion.

Graph-Mo also offers other advantages. It responds uniformly to heat treatment, permitting close tolerances in the parts. It has good stability, and is easier to machine than ordinary tool steels.

For information on the four Timken graphitic tool steels and their use in punches, dies, gages and machine parts, get the new 10th edition of "Timken Graphitic Steel Data Book". Write on your business letterhead to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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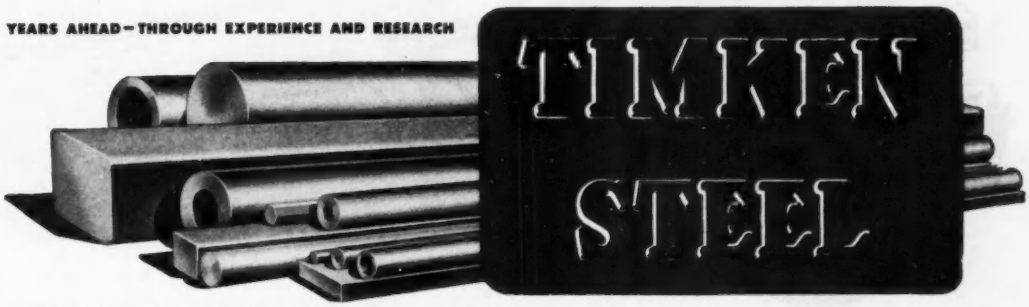

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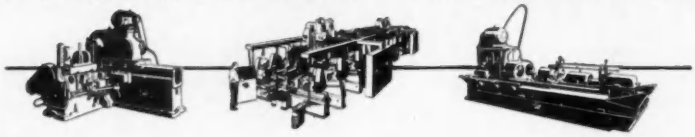

● One of the best equipped plants in the Midwest, W. F. & John Barnes is geared to provide an unusually broad machine tool building service. Machining, fabricating, and assembly departments for tools, gauges, fixtures, hydraulic, electrical, and conveyor equipment are centralized, and work is coordinated in one plant with planning, designing, and engineering. With these complete facilities, Barnes is in position to help you solve problems quickly and efficiently. The complete, coordinated service with undivided responsibility includes:

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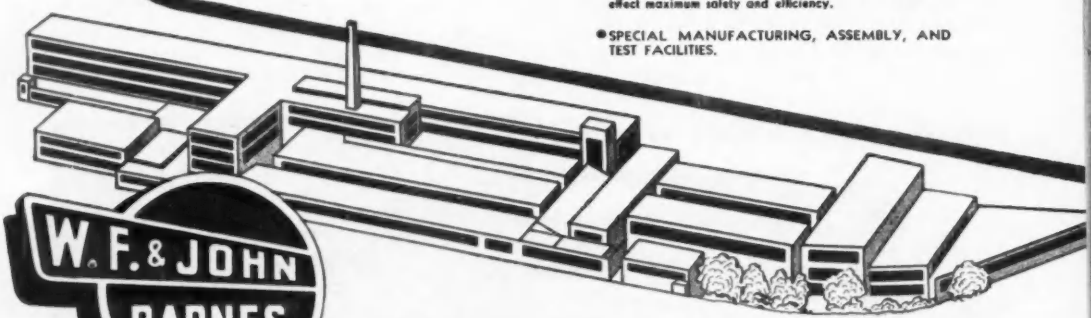

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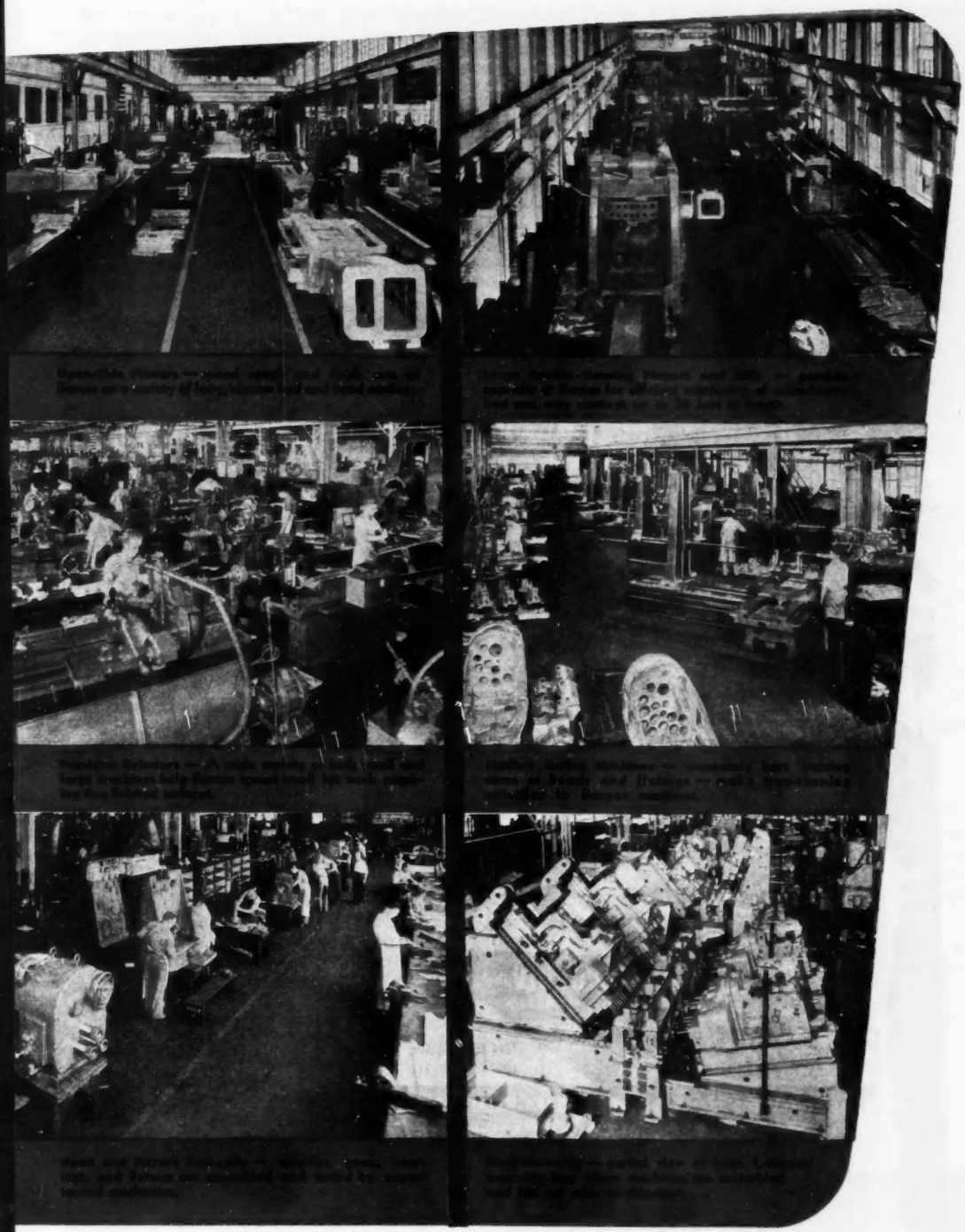


W. F. & JOHN BARNES COMPANY 312 S. Water St. Rockford, Illinois

Le Mans Race

(*Continued from page 86*)

ing of drums, but it is not yet sufficient.

If the Mercedes were not the fastest cars at Le Mans, they were the best all around performers. One of them was forced out with a defective generator. Another cracked a wheel hub when it hit a boundary stone, but was only slightly delayed, and the third had no trouble.

On formula (distance in relation to piston displacement) the winner was an aircooled twin cylinder Panhard, followed by the two Mercedes. The Nash-Healey came seventh under this classification and the Cunningham thirteenth.

OBSERVATIONS

(*Continued from page 72*)

testing, using high vacuum pumps, is a comparatively simple procedure in which the cavity is evacuated quickly, then held for a few seconds. The vacuum gage is the sole indicator. If the reading holds steady, the part is accepted; if there is any leakage, the gage will drop. Such equipment also can be employed for testing sealed mechanisms. In this instance, the sealed assembly can be placed within an air-tight cabinet which is then evacuated. This new method promises to make messy water testing for leaks a thing of the past.

Production Forums

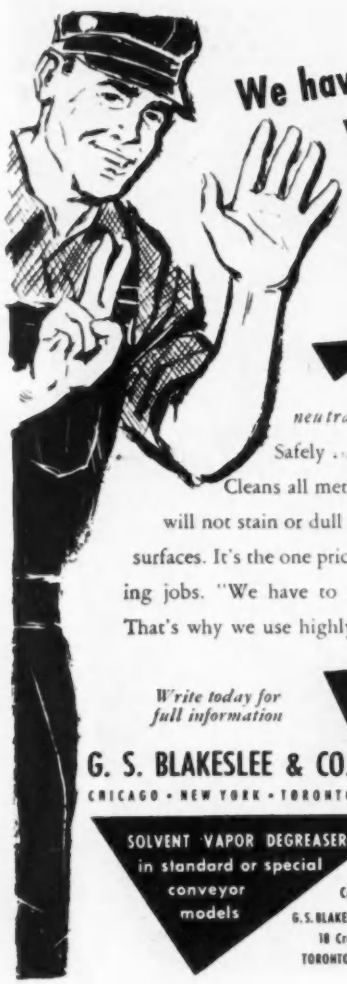
Production panels or forums conceived by the SAE Production Activity some years ago and time tested in Cleveland and Detroit, and more recently in Milwaukee and Los Angeles, have assumed unusual acceptance in SAE circles. So much so that in 1953 the SAE has undertaken an ambitious schedule of five such meetings. Significantly, panel members are just as enthusiastic as are the audiences.

Ford Presents

"Tomorrow Meets Today," a new film previewed recently in Detroit, gives a glimpse of behind-the-scenes activity in the development of new models at Ford. Many of those around Detroit will recognize the setting of the Ford Engineering Exhibit held some months ago prior to introduction of 1952 models. The film is intensely interesting and instructive, particularly for those who do not often get behind the scenes. It would make an attractive feature to round out an SAE meeting.

Aluminum Diesel

Watch for details of a revolutionary Diesel engine which should be announced soon. It is an all-aluminum engine in the strictest sense of the word. Specific weight (lb/bhp) is expected to be fantastically low compared with conventional Diesel practice.



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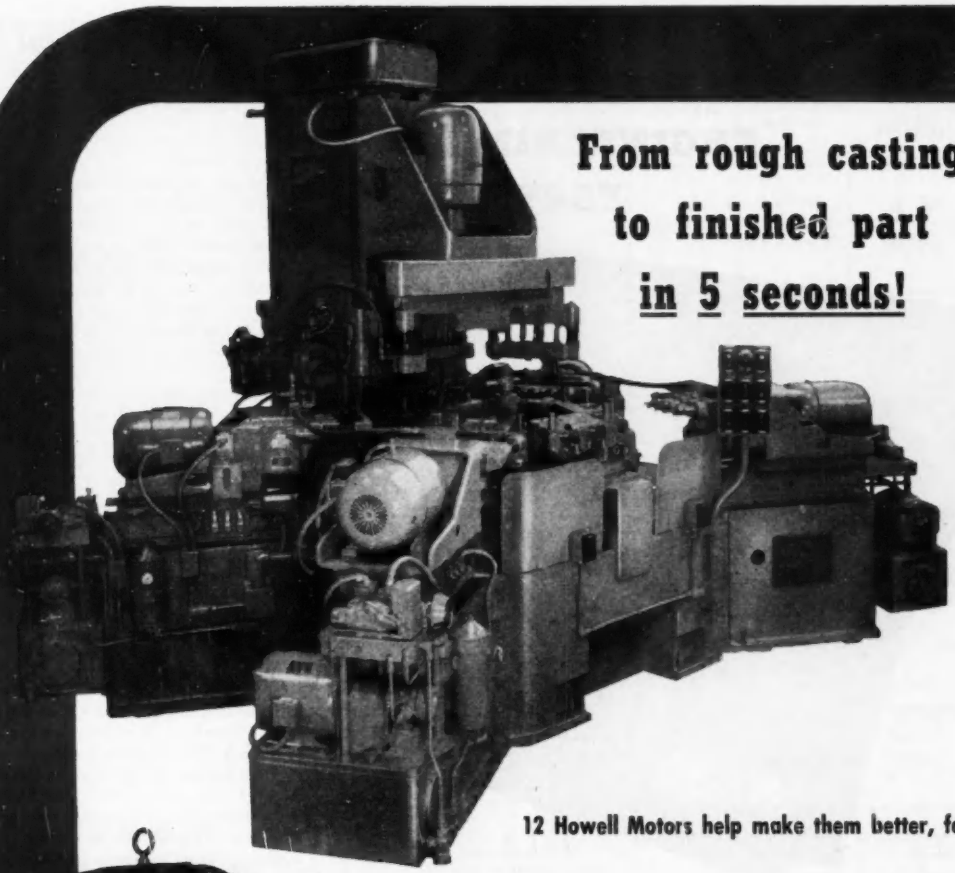
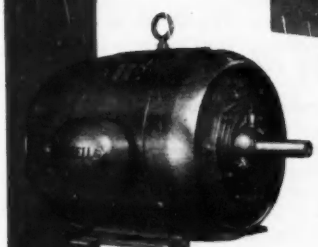
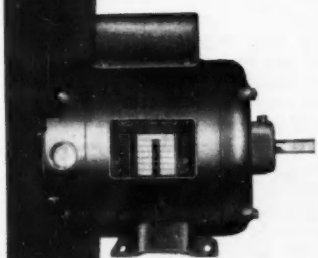


12 Howell Motors help make them better, faster!



Type K Motor. Totally enfan-cooled. Sizes from 200 H.P. at 1800 RPM.



al horsepower Howell are furnished in standMA frames as either totally enclosed types.

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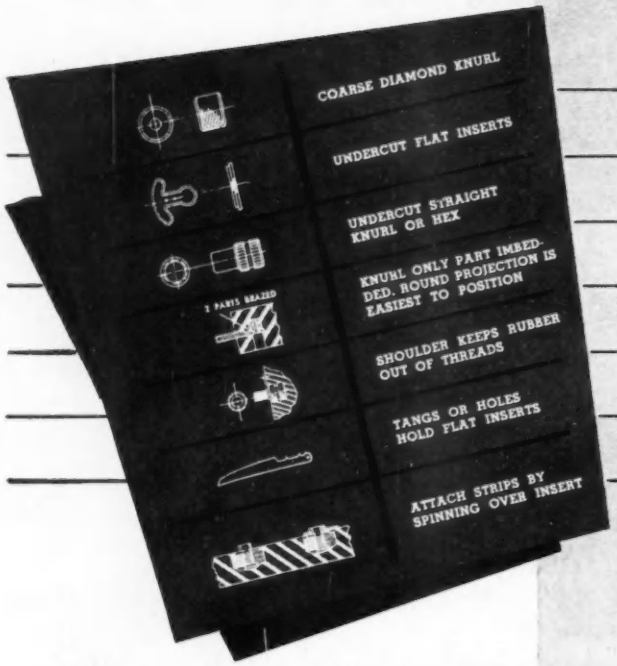
HOWELL Red Band MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built industrial motors since 1915

MATERIALS ENGINEERING FACTS


COARSE DIAMOND KNURL
UNDERCUT FLAT INSERTS
UNDERCUT STRAIGHT KNURL OR HEX
KNURL ONLY PART IMBEDDED. ROUND PROJECTION IS EASIEST TO POSITION
3 PARTS BRAZED
SHOULDER KEEPS RUBBER OUT OF THREADS
TANGS OR HOLES HOLD FLAT INSERTS
ATTACH STRIPS BY SPINNING OVER INSERT

hints for molding metal inserts in ACE HARD RUBBER . . .

It takes no less than 70 pages in the new Ace Handbook to cover the amazing versatility of Ace Hard Rubber! For instance, you'll find a choice of many different compounds . . . tensile strengths to 10,000 psi, dielectric strength over 600 v/mil, heat resistance as high as 300°F., water absorption as low as 0.04% . . . in molded parts, sheets, rods, tubes and linings . . . with complete (among world's largest) facilities for design, molding, extruding, finishing . . . for thousands of applications. Always check your Ace Handbook when selecting materials for today's production and tomorrow's plans. It's free—write today.

100th ANNIVERSARY

American Hard Rubber Company

93 WORTH STREET · NEW YORK 13, N. Y.

Quality Control

(*Continued from page 74*)

departments is necessary for successful operation.

The desired work is based on well trained foremen, who see that all the men under their direction have the proper tools with which to work, receive material which is right for their operations and know exactly what they are supposed to do when they get the two together, so that inconsistencies in production will disappear.

It is dependent also on inspectors who know their own work well, who command the respect of the men whose work they are judging, who have an innate, sometimes an instinctive, sort of seventh sense which tells them when it is all right to use a provisional okay which will allow production to go on until defects can be corrected, when a bit more tolerance than specified can be allowed—and even more important—when not to allow these things.

The key man in such a setup is the chief inspector. In our organization he holds a rating far above that given chief inspectors in many plants. In addition to holding the standards of his inspectors at the highest level, he must have the ability to meet and understand the customer, and the ability to transfer the knowledge he obtains of the customers' problems to our working force.

So important is this ability to transfer information considered, that we have adopted the sketch method of reporting errors to each department. The chief inspector explains what he has seen, and uses charts and sketches to show exactly what he means. This may not be the fastest method known, but, we feel that it is a safe, sure method and leaves no room for later argument.

So vital do we consider our customer relation that no one overrules our chief inspector. He is the man in our organization who passes on all the material we make—in a sense, he buys it from our shop to sell it to our customers.

Quality developed and coordinated leads inevitably to quality controlled. Quality continuously controlled leads to quality maintained, the highest standard possible in industry.

We have had quality maintained in parts of the Budd Co. for 15 years. It started in our stamping assembly lines, when it was noticed that fore-

(*Turn to page 94, please*)

19 1⅛″–2¾″	14.0 MIN. (Hand Screw Machine)	9.5 MIN.
32 1″–2¾″	5.0 MIN. (Old Style S.S. Automatic)	3.7 MIN.
12 2½″ DIA.	15.0 MIN. (Hand Screw Machine)	5.4 MIN.
5 2½″ LONG	20.2 MIN. (Hand Screw Machine)	12.0 MIN.
16 1³⁄₁₆″–2⁷⁄₁₆″	11.0 MIN. (Hand Screw Machine)	7.0 MIN.
10 2″ DIA.	7.5 MIN. (Hand Screw Machine)	3.2 MIN.
16 4⅛″ LONG	27.0 MIN. (Hand Screw Machine)	12.5 MIN.

500 PIECES
IN THE BIN...FOR THE
COST OF 100!

The Acme-Gridley Model M Single Spindle Automatic Bar Machine cuts costs on small-lot work—and speeds production, too.

That's the customer-documented experience of The Elliott Company, in their Springfield, Ohio plant. The figures in the table above are their own—as is the statement of cost saving. They further state that these savings will recover cost of the machine in three years.

Notice the wide variety of parts, and the uniformly faster machining times on each—an average production increase of 87%. But faster production and versatility are only part of the story. Additional savings—in machine and tool investment, in floor space, in man hours—go to make up the five-to-one reduction in production costs realized by The Elliott Co.

All of these are the direct results of inherent design features of the Model M: wide, open tooling zones, for easy access; heavy, rigid frame construction, to permit the use of carbide tools; simple camming, for quick change-over; three automatic spindle speed ranges, for most efficient cutting; independent camming for the eight tool slides, to permit combining cuts—these and many more.

Learn about them in Bulletin M-50, your guide to lower machining costs on small-lot work.

The NATIONAL ACME CO.
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Quality Control

(*Continued from page 92*)

men did not always catch errors pointed out to them. Mimeographed sheets were made of our complaints and hourly checks were requested on stampings coming from the assembly lines to see if the corrections were being made. Naturally, there were arguments at first that too much work was being added.

When the purpose was understood and results shown, the foremen pointed out that often they were receiving a poor product in the beginning. The same system was inaugurated in the press shop; almost at once complaints became less and quality became better. .

The fact that we have three unions, CIO, AFL, and Independent, gives added proof of the value of this system. Many would have doubted results under these conditions.

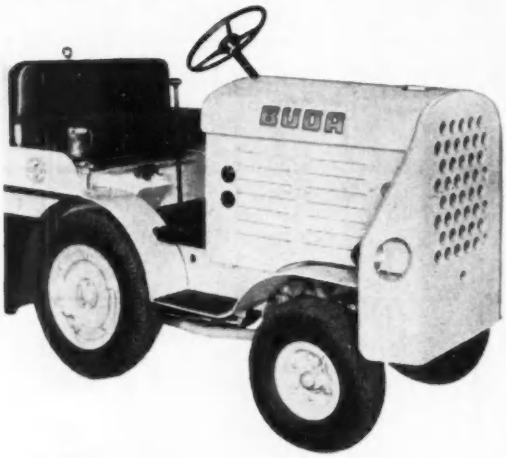
In our method of stamping procedure, after a draft is made on a body, detailed drawings are made. These details are again laid out to see if all parts fit. Drawings are then sent to the pattern shop and models are made, but the model is checked to the piece drawing before releasing for die template, die building, or any other use.

At this point, the customer's inspection department and our own inspection department, along with the customer's master mechanic division have a meeting to discuss tolerances and these tolerances are set up for final stamping. Consideration is given to welding methods, fit of parts and unit assembly, with the result that the customer gets parts which assemble with the least amount of labor.

Although we use and believe in control charts, we are less enthusiastic about them than many companies. We prefer to build a foundation of personal responsibility for quality control and see no reason for setting standards of perfection impossible to attain.

When basic operations have been carefully planned and carried out, charts are desirable and helpful. They will tell a foreman when to watch his tools, or when his finish is unsatisfactory. We have double controls in our machine setups, and never allow the man at the machine to have a set of gages with the full product tolerance. This prevents the production of much scrap material.

We feel also that our type of quality control has great bearing on the morale of the man on every job. It is believed by the Budd organization that the extent to which work can be a source of satisfaction to a man is in direct ratio to the quality of the work which he produces.



Where **BUDA TRACTORS** take rough going!

TUTHILL Alloy Steel **SPRINGS**
cradle driver and equipment

Wherever wear-and-tear of constant travel over uneven plant yards, rough track crossings or roadbeds are part of the job . . . TUTHILL SPRINGS are part of the specifications.

Big equipment or small, heavy or fragile loads, power shovel or light station wagon, there's a TUTHILL SPRING for top efficiency and long, low-cost service.

Special Leaf Springs designed to meet any requirements

Write for complete details now!

TUTHILL SPRING CO.

760 WEST POLK STREET • CHICAGO 7, ILLINOIS

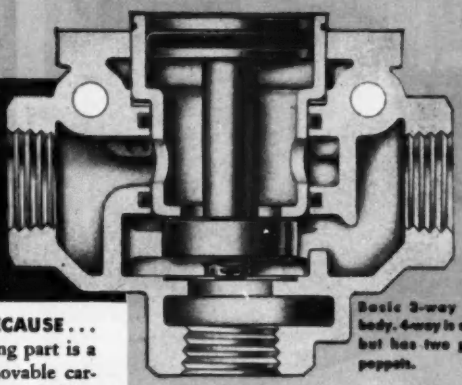
K-F Forms New Division for Electronics Output

Kaiser-Frazer Corp. is entering the electronics manufacturing business. The company has announced that its wholly owned subsidiary, K-F Manufacturing Corp., has established the Kaiser-Sanders Electronics Div. with headquarters at Nashua, N. H., and has leased a plant there from Textron Corp.

Sanders Associates, Inc., of Waltham, Mass., already established in the electronics industry, has subleased space from Kaiser and will move its research and development laboratories to the new facility. The Sanders engineering staff will be integrated with the Kaiser production organization.

HERE'S a Valve Design Every Maintenance Man Will Appreciate!

NEW HANNIFIN *P-M* *Pilot-Master Valves*



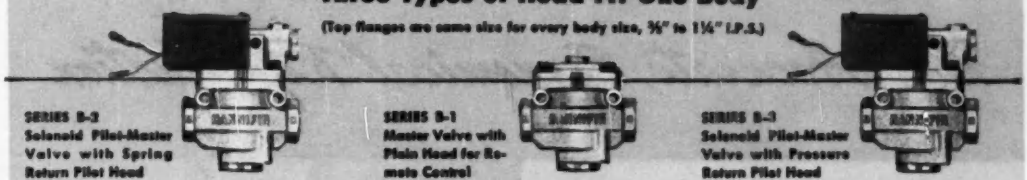
Basic 3-way valve body. 4-way is similar but has two piston poppets.

THIS NEW DESIGN REDUCES DOWN TIME, BECAUSE... there are no springs in the main valve... only moving part is a piston-poppet assembly which fits in an easily removable cartridge, replaceable without disturbing line connections. Besides, in the entire line, there are only two body designs, one for 2-way and 3-way, another for 4-way. The basic 3-way valve operates either 2-way or 3-way, normally open or normally closed, without any internal change whatever. Interchangeable heads give choice of pneumatic or electric control. What all this means is fewer valves to stock, fewer parts to stock, less time lost replacing valves, parts, or control heads.

- **Fewer Valves to Stock**
- **Fewer Parts to Stock**
- **Maximum Interchangeability**
- **No Springs in Main Valve**

Three Types of Head Fit One Body

(Top flanges are same size for every body size, ⅜" to 1¼" I.P.S.)



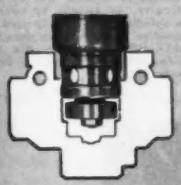
SERIES B-2 Solenoid Pilot-Master Valve with Spring Return Pilot Head

SERIES B-1 Master Valve with Plain Head for Remote Control

SERIES B-3 Solenoid Pilot-Master Valve with Pressure Return Pilot Head

features you find in no other valves, compare!

New cartridge design—instantaneous operation, provides speeds to 600 cycles per minute—continuously rated, low amperage solenoids, positively mounted—full pipe capacity—pressure range from 15 to 150 P.S.I.—corrosion resistant throughout—will operate on liquids as well as air—choice of 10 Pilot Valves, ¼" I.P.S., for remote control of Master Valves.



Exclusive Replaceable Cartridge

Contains every moving part of Master Valve. Two sizes fit all 5 valve sizes. Easily replaced without disturbing main piping connections.

Write for the Complete Story

Get it today!

Bulletin 231. Shows and tells all about the new Hannifin P-M line... Pilot Valves, Master Valves, Pilot-Master Valves . . . 2-way, 3-way, 4-way.

HANNIFIN

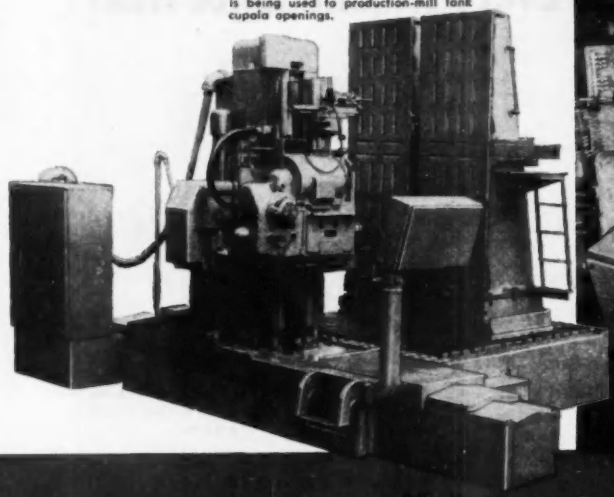
Hannifin Corporation, 1143 S. Kilbourn Ave., Chicago 24, Ill.

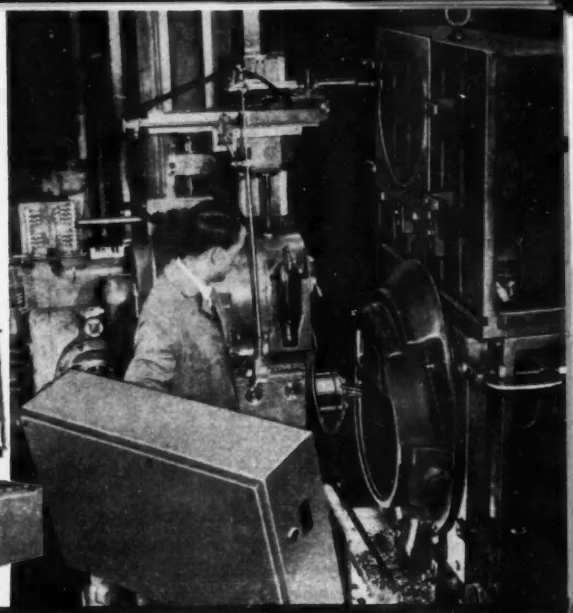
Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

TYPE

BG-21

Made with work capacities ranging from 5 feet to 10 feet horizontally and 2½ feet to 4 feet vertically, in single spindle and two-spindle types, this latest model in the KELLER line incorporates all the advanced features of the larger Type BG-22. In this KELLERING operation, profiling control is being used to production-mill tank cupola openings.





INDUSTRY HAS A WORD FOR IT

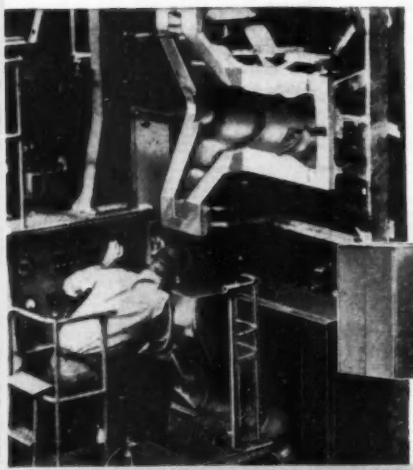
KELLERING

Fast, Accurate, Economical Profiling

TYPE

BG-22

Largest in the KELLER line, the huge BG-22 is made with work capacities ranging from 10 feet to 20 feet horizontally and 5 feet to 7 feet vertically, in single spindle and three-spindle types. Widely used in the automotive industry, it is shown here KELLERING a forging die for a non-ferrous press forging for the aircraft industry.



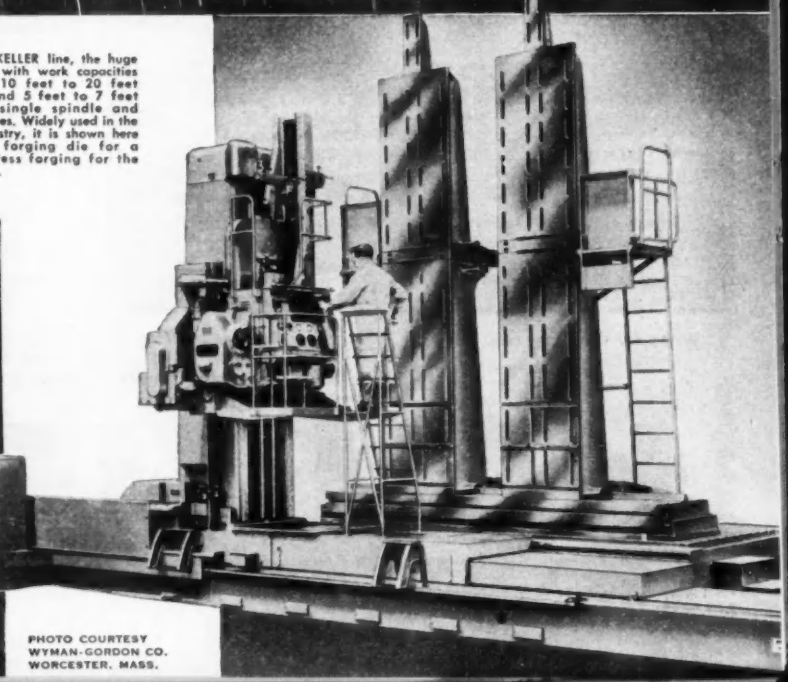
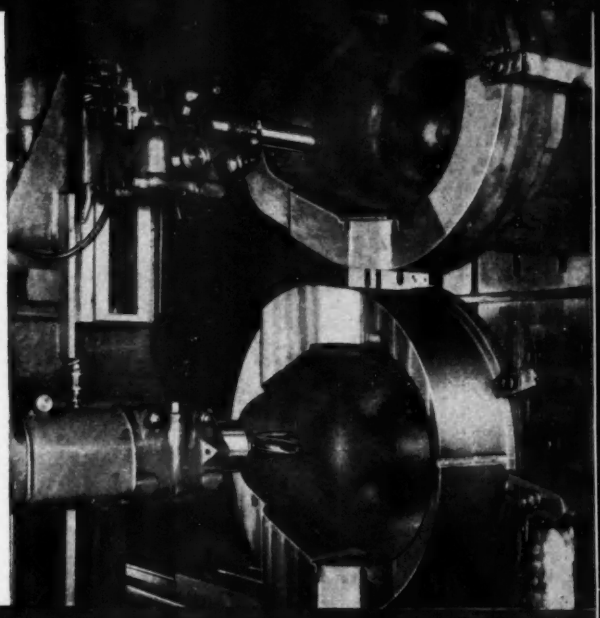


PHOTO COURTESY
WYMAN-GORDON CO.
WORCESTER, MASS.

TYPE

BL

Designed specifically to handle the smaller jobs economically and efficiently, the Type BL is made in two sizes for work areas of 24" x 16" and 36" x 20". A three-spindle machine is also made for the production manufacturing of small parts. The photo at right shows a single spindle machine cutting a precision die casting die in steel from a wood master.



PRATT & WHITNEY

KELLER MACHINES

Automatic Tracer-Controlled Milling

Experience gained during nearly 40 years of designing and building tracer-controlled milling machines combined with Pratt & Whitney's over 90 years of manufacturing precision tools has made the P&W-KELLER Machine the finest of its kind ever produced. It has become so basic and so popular in industry that this type of machining is now universally known as "KELLERING".

Pratt & Whitney-KELLER Machines are powerful, horizontal spindle millers controlled by an electric tracer. They faithfully reproduce the shape of any 2- or 3-dimensional master form or pattern. Very complicated shapes are duplicated as economically as simple work. Designed specifically for tracer-controlled milling, KELLER Machines are unequalled for speed and accuracy, total machining time is much less than that required by any other method, and a minimum of hand finishing is needed. In the production of dies, molds, punches and in many other duplication jobs, you can look to P&W-KELLER Machines for new standards of speed, accuracy, convenience and economy. A complete line, with a wide range of work capacities, makes any job the right size for "KELLERING".

Write on your Company letterhead for fully descriptive KELLER Bulletin No. 490-2 for the smaller work sizes or Bulletin No. 537 for large work.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

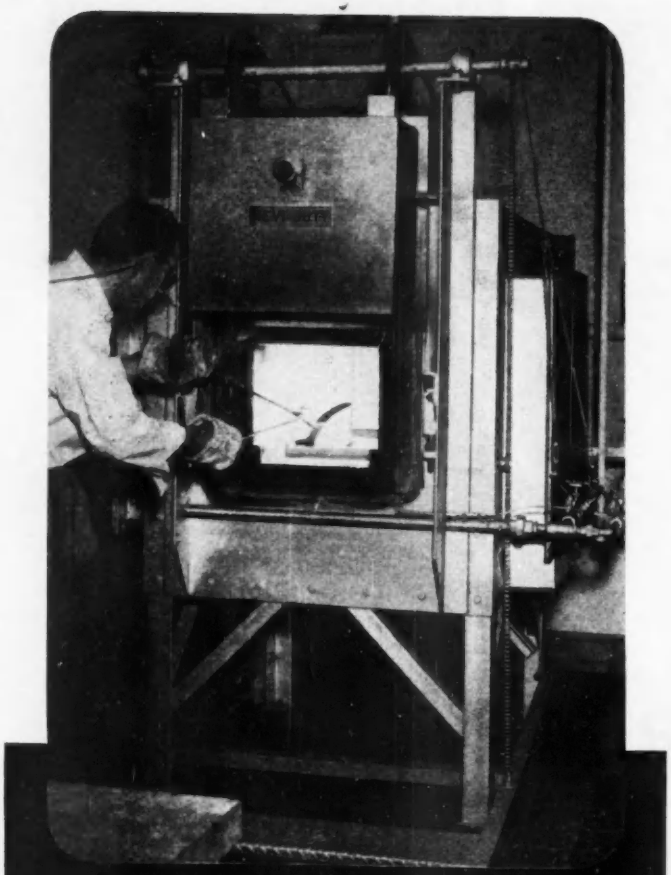
WEST HARTFORD 1, CONNECTICUT, U. S. A.

No. 537 No. 490-2

First Choice P&W *for Accuracy*

Branch Offices . . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stanco Co.) • DETROIT • HOUSTON (The Stanco Co.) LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

CUTTING TOOLS • GAGES • MACHINE TOOLS



Production Heat Treating Techniques are Determined in
HEVI DUTY FURNACES

A large automotive and ordnance manufacturer uses Hevi Duty high temperature furnaces in its metallurgical laboratory for determining production heat treating cycles.

These furnaces provide the uniform heat needed in this important work. Temperatures are accurately controlled to 2600° F. For day in day out production or precision laboratory work rugged Hevi Duty furnaces will meet your requirements. Write for bulletin IND-741 today.

HEVI DUTY

HEVI DUTY ELECTRIC COMPANY
MILWAUKEE 1, WISCONSIN
Heat Treating Furnaces... Electric Exclusively
Dry Type Transformers Constant Current Regulators

METALS

(*Continued from page* 70)

trend toward the higher level. Canada sold its copper at 33 cents to the British Ministry of Supply but quoted 36½ cents to the United States and 29½ cents to its own users. The British Ministry raised its selling price to 33.7 cents f.a.s. New York.

Whether these high foreign prices will continue is debatable. Most trade authorities believe they will decline and ascribe their present strength solely to uncertainty over the domestic supply situation if strikes take place. If this uncertainty is removed a world price of 28-32 cents per lb seems probable.

Rhodesian and Belgian Congo producers who, almost alone among world copper miners, have shown sizable increases in output since Januaryy of this year, have been selling to Great Britain on a short term basis at 33 cents per lb. Their production is scheduled further to increase before the end of the year.

Zinc Tariff Imposed

The Tariff Commission informed the President on July 3 that the average price of slab zinc in June was below 18 cents per lb and under the law the import duty at 6/10 cents per lb on the zinc content of ores and 7/10 cents per lb on slab must be reimposed. Obviously with zinc in free supply at 15 cents the tariff will not keep out foreign supplies. There is some belief that of more benefit to the zinc prolucers would be for the Government to start to buy zinc for a civilian stockpile. This would remove from the market surplus metal that is becoming burdensome and might well lead to further price reductions.

Larger output of zinc is anticipated in the second half of the year as important new zinc mines here and in Canada come into larger production. It is extremely unlikely that zinc smelters will be scrambling for ore as they were in 1950-51. The Joplin ore market is paying $100 per ton for 60 per cent zinc concentrates, a reduction of $35 per ton from the price established last October.

Government Stockpiling Ups Lead Price

Definite announcement that the Government would buy 30,000 tons of lead over the remainder of the year gave the lead market the shot in the

(*Turn to page* 102, *please*)

WORCESTER, MASS.

1952 Mobilgas Economy Run Proved Again

B-W Overdrive *pays off!*

Top 10 cars (on miles-per-gallon basis) including Sweepstakes winner —*all equipped with this famous Borg-Warner Transmission unit*—averaged

25.8 MILES PER GALLON

Again this year the records proved: B-W Overdrive means more miles per gallon of gas!

In the grueling, 1415.4-mile Mobilgas Economy Run—sanctioned and supervised by the Contest Board of the AAA—the 10 best actual miles-per-gallon records were made by 1952-model cars equipped with Borg-Warner Overdrive.

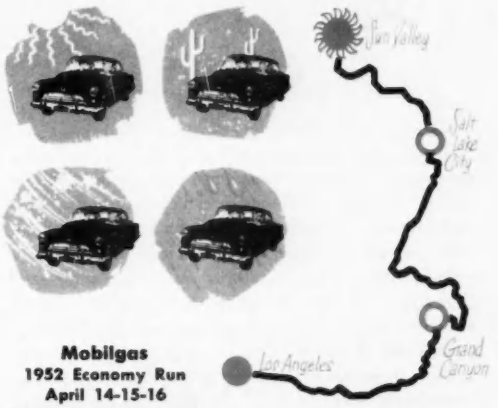
And in *every* year of this annual contest, the *ton-miles-per-gallon* Sweepstakes winner has been equipped with this famous Borg-Warner transmission unit.

What better proof could you want of real fuel economy!

3 MILES "FREE" IN EVERY 10!

An advanced-type transmission, B-W Overdrive automatically cuts engine revolutions 30%. At 50, for instance, the engine is taking it easy at only 35! That saves gas—hands the owner as much as 3 miles "free" in every 10. Saves engine wear, too—means longer life and fewer repair bills.

Made exclusively by B-W's Warner Gear Division, Overdrive is now offered on 11 leading makes of cars. Proof again that . . . *B-W engineering makes it work—B-W production makes it available.*



Mobilgas
1952 Economy Run
April 14-15-16
Sanctioned and Supervised by Contest Board A.A.A.

Toughest car driving contest in all the world . . . spanning all four seasons and all-year driving conditions in a 35-hour run of 1415.4 miles from Los Angeles to Sun Valley, Idaho, over a course with altitude from 70 ft. below sea level to 8010 ft. above . . . from mountains to desert, and from icy roads to intense heat.

Borg-Warner

ENGINEERING B-W PRODUCTION

THESE UNITS FORM BORG-WARNER, *Executive Offices, Chicago:* BORG & BECK • BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • DETROIT GEAR • FRANKLIN STEEL • INGERSOLL PRODUCTS • INGERSOLL STEEL • LONG MANUFACTURING • LONG MANUFACTURING CO., LTD. • MARBON • MARVEL-SCHEBLER PRODUCTS • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • MORSE CHAIN CO., LTD. • NORGE • NORGE HEAT • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WARNER GEAR CO., LTD. • WOOSTER DIVISION

Two grinding at once with Norton

6" or 10" angular wheelslide grinders

- Grind thrust surface and adjacent diameters simultaneously
- Cut production costs
- Save time, labor

Get rid of separate shoulder grinding! Grind thrust surface and adjacent diameter to fine accuracy and finish *in one automatic operation!* "One lever" cycle control on these Norton hydraulic semiautomatic cylindrical grinders helps your operator produce more work with less effort. What's more, you get concentric grain pattern in finish of thrust surface. This gives you a superior seal surface and better appearance than old-style method of grinding with side of wheel. Special features also assure ease and speed of maintenance and servicing.

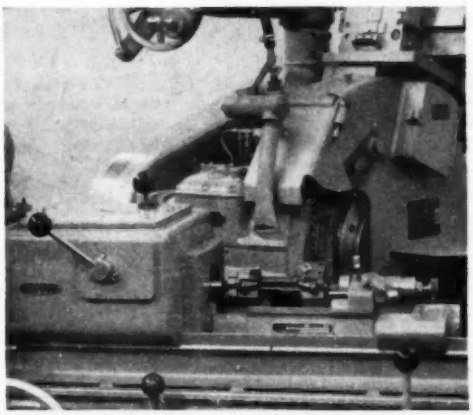
These time- and labor-saving standard Norton angular wheelslide grinders can also be adapted for *special* jobs, thanks to Norton's long experience and special Norton devices that make such adaptations possible.

Remember, too, the Norton angular wheelslide grinders are but two of many Norton machines, *representing the world's most complete line of grinders* . . . products of Norton engineering leadership.

Only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

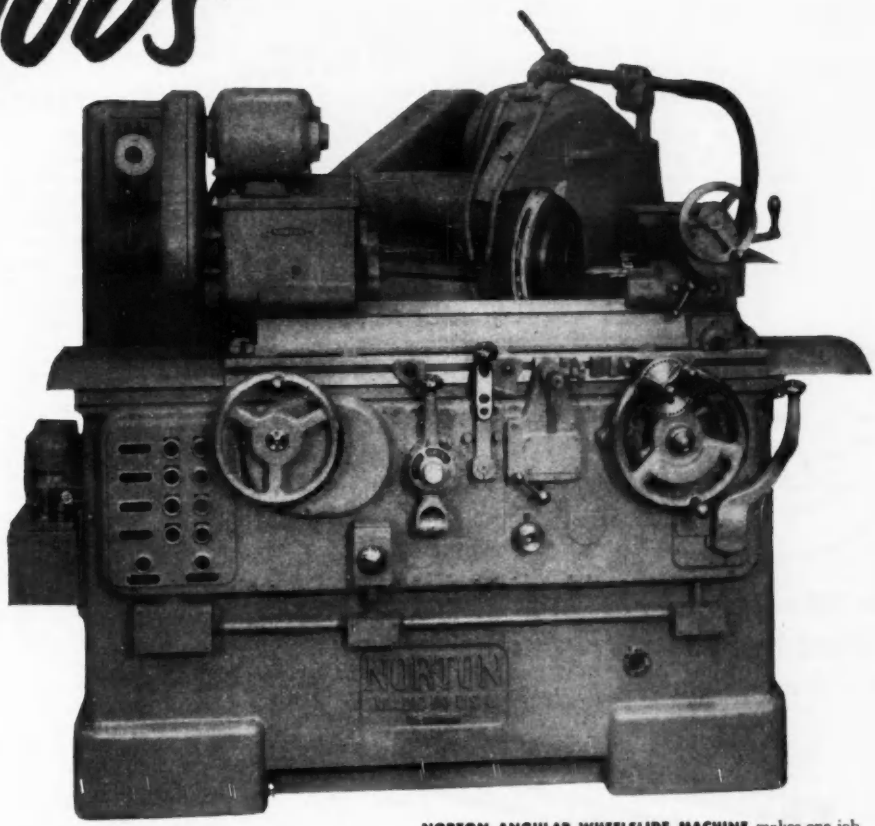
If you're planning now for "post-emergency" production, we will be happy to discuss with you your requirements in grinding machines and to fit tentative delivery schedules into your plans.

For further information on the Norton 6" or 10" angular wheelslide grinders ask your Norton Representative for Catalogs 1793 and 533, or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass.

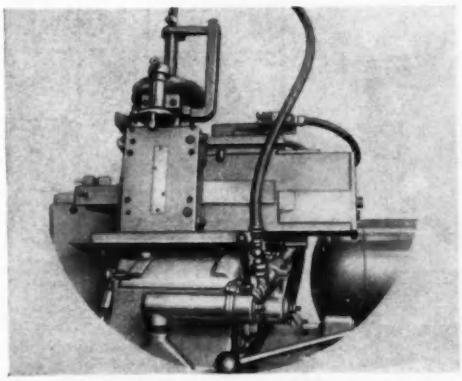


THIS NORTON CAM-O-UNIT on a 10" angular wheelslide machine is typical of how Norton engineers can adapt standard machines to special jobs. Unit shown is grinding the radius and platform surfaces of jet engine blades.

jobs



NORTON ANGULAR WHEELSLIDE MACHINE makes one job out of two by grinding thrust surface and adjacent diameter simultaneously. Pictured above is standard 6" angular wheelslide machine.



NORTON'S WHEEL GUARD TRUING DEVICE replaces hand-operated equipment, decreases effort, time, and skill needed to true wheels. It increases production, wheel life, diamond life, and is easily built into Norton angular wheelslide grinders. Operator merely pushes button when truing is needed, diamond automatically traverses both surfaces of wheel.

To Economize Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland Chicago • Detroit

In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

METALS

(*Continued from page 98*)

arm needed to raise the price quickly from 15 to 16 cents per lb. This lead would be used for a civilian stockpile and purchases would be made at the market price.

Lead bought by the Government would be resold to industry as needed to prevent any pinch in supplies such as developed in 1951. If any metal was unsold at the end of the year it would revert to the military stockpile.

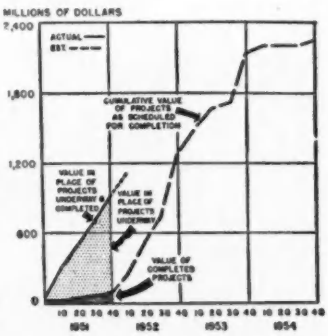
The announcement did not evoke unstinted enthusiasm from the industry. It was concerned that the Government's decision to buy and sell lead would put it definitely in the lead business to a larger extent than ever and might not jibe with the industry's best interests. Experience with Government trading in other metals, notably in tin, has not promoted much faith in its infallibility.

Continued improvement was noted in the business of the battery manufacturers. Estimated total industry shipments of replacement batteries in May were 1,139,000 units, up 33 per cent over April, with the best buying months ahead.

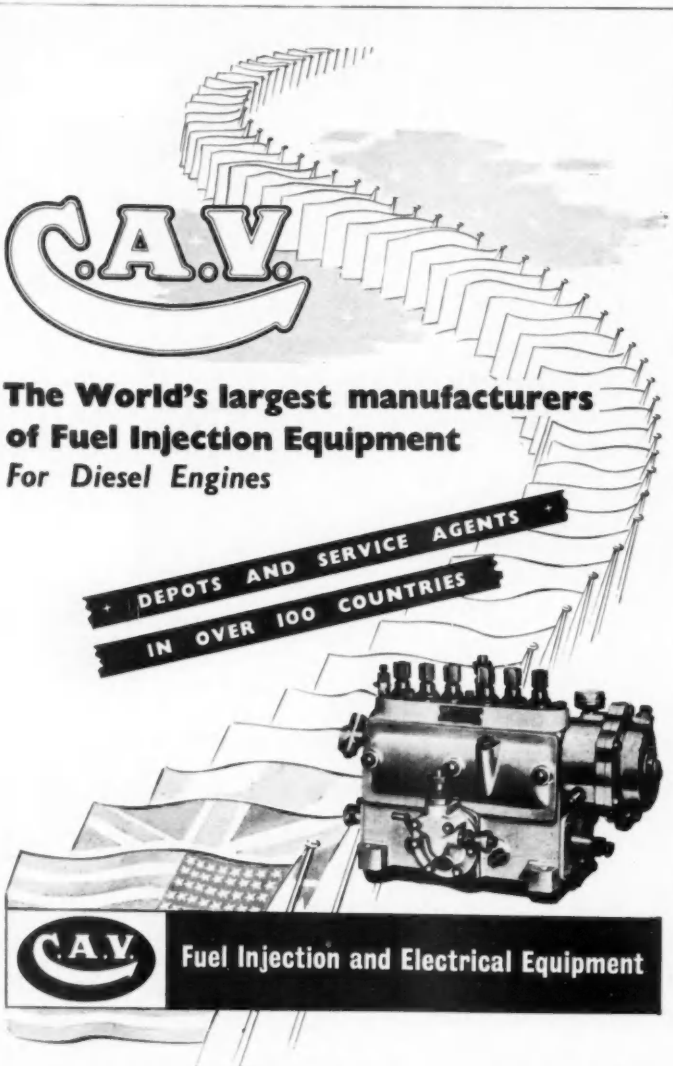
Less Belief That Tin Price Will Advance

Early in July it was announced that Government and industry stocks of tin had increased about 9000 tons at the end of April, with further substantial tonnages afloat for this country. This relieved fear of a tin shortage even with the Bolivian impasse. It seems doubtful that Bolivia will be given a higher settlement price than $1.21½ cents per lb New York. However, decontrol of tin is unlikely for several months.

Much interest in tin circles is displayed by an announcement from Belgian Congo, that amazingly mineral-rich country, that Geomines will proceed with development of what may prove to be the richest body of tin ore in the world. So impressive are the drillings that the mine management has felt obliged to give earnest assurance that care would be taken not to flood the tin market with cheaply won metal. While there is no immediate likelihood of new production from this source, the outlook a year or two hence is for a new and important source of supply to replace the depleted deposits of Malaya.



The actual value of steel works and rolling mill facilities underway and completed by the fourth quarter of 1951 is shown by the solid line. The dotted line following is an estimate to the first quarter of 1952. Cumulative value of projects as scheduled for completion is depicted by the line of dashes. Value, in place, of projects underway is shown by the light shaded area, while the value of completed projects is illustrated by the dark area.



C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK 19, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO

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It may pay you to buy "on time" —the time it takes to assemble your product. And if you're troubled by "blind spots," hard-to-get-at bolts and nuts,

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CALENDAR

OF COMING SHOWS AND MEETINGS

SAE West Coast Meeting, San Francisco, Calif. .....Aug. 11-13

Third Annual Elkhart Lake Road Races and Rally, Sports Car Club of America, Elkhart Lake, Wis. .....Sept. 5-7

Copenhagen Truck Show, Copenhagen, Denmark .....Sept. 5-14

American Standards Assn., Third National Standardization Conference, Chicago, Ill. .....Sept. 8-10

Instrument Society of America (seventh annual meeting), Cleveland, Ohio .....Sept. 8-12

SAE Tractor Meeting, Milwaukee, Wis. .....Sept. 9-11

16th Commercial Show, Earls Court, London, England .....Sept. 26-Oct. 4

SAE National Aeronautic Meeting, Los Angeles, Calif. .....Oct. 1-4

Paris Automobile Show, Paris, France .....Oct. 2-12

Society of Industrial Packaging and Materials Handling Engineers, 7th Annual Exposition, Chicago, Ill .....Oct. 13-16

37th International Motor Exposition, London, England .....Oct. 22-Nov. 1

National Metal Show, Convention Hall, Phila., Pa. .....Oct. 20-24

SAE Transportation Meeting, Pittsburgh, Pa. .....Oct. 22-24

Transport Aircraft Hydraulic Conference, Park-Sheraton Hotel, Detroit, Mich. .....Oct. 28-29

SAE National Diesel Engine Meeting, St. Louis, Mo. .....Oct. 30-31

Montreal Tool and Equipment Show, Show Mart Building, Montreal, Canada .....Nov. 11-14

16th Annual Time and Motion Study and Management Clinic, Industrial Management Society, Sheraton Hotel, Chicago, Ill..Nov. 5-7

SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla. .....Nov. 6-7

Third Annual International Motorama, Los Angeles, Calif. ..Nov. 7-16

API 32nd Annual Meeting, Conrad Hilton Hotel, Chicago, Ill...Nov. 10-13

American Institute of Electrical Engineers Conference on Recording and Controlling Instruments, Benj. Franklin Hotel, Phila., Pa. .....Nov. 17-18

7th Midwest Conference, American Society for Quality Control, Claypool Hotel, Indianapolis, Ind. .....Nov. 20-21

1953

Plant Maintenance Show, Public Auditorium, Cleveland, Ohio..Jan. 19-22

National Transport Vehicle Show and Fleet Maintenance Exposition, New York, N. Y.....Feb. 24-27

American Society for Testing Materials, Spring Meeting, Detroit, Mich. .....Mar. 2-6

National Association of Corrosion Engineers Ninth Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill.....Mar. 16-20

German Vehicle Show, Frankfort, Germany .....Mar. 19-29

Fifth Materials Handling Exposition, Convention Hall, Philadelphia, Pa. .....May 18-22

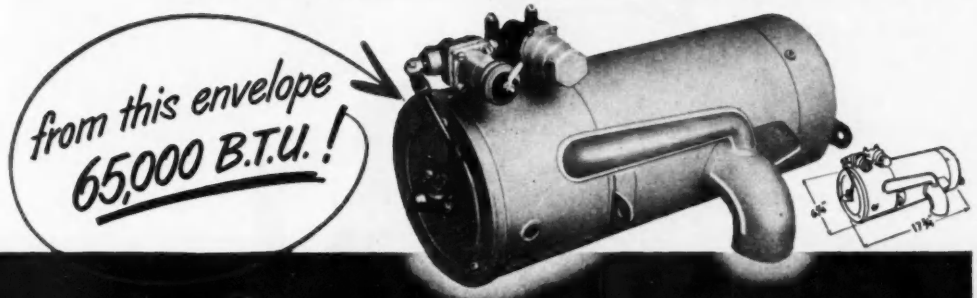
American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.....June 29-July 3

Eighth National Instrument Conference and Exhibit, Chicago, Ill., Sept. 21-25

New! Warm Air Pre-Heating for Diesel Engines

Another revolutionary SOUTH WIND first!

Brings the same quick, reliable engine starting enjoyed by major aircraft and military vehicles to any type of diesel engine!



An entirely New application! Works independently of engine heat... engine operation! Makes starting easier, faster at all temperatures

Lower in cost! Smaller in size! Easy to install on practically any diesel model!

Nothing like it now—or ever before! This great new South Wind Pre-Heating advance! Specially designed for diesel applications. Specially engineered to end forever the problem of hard, slow diesel engine starting at any temperature—*even at 65° below!*

A new principle!

Applies clean, non-corrosive, heated dry air *directly* on friction parts *inside* the engine. Perfected by South Wind, this system also heats the lubricating oils. Assures faster, more efficient warm-up of critical parts than any indirect method of transferring heat.

Resistance to cranking power minimized!

The engine is cranked with warm parts and warm lubrication. *Only clean heat* is used to raise the temperature of induction air. This factor assures normal and reliable ignition . . . for quick, sure starting under cold conditions.

Small in size! Light in weight!

Equally effective on either automotive or stationary diesel engines, this new South Wind Pre-Heater burns any required liquid fuel, can be operated automatically or manually. Can be easily, quickly installed on practically any diesel model.

Check these exclusive advantages! Only South Wind offers them all in this new method of Diesel engine pre-heating

1. **Quick, easier starting at —65°F.**
2. **Conforms to latest military requirements.**
3. **Adequate lubrication at all times.**
4. **Lower maintenance cost.**
5. **Longer engine life.**
6. **No interrupted service.**

Now at your disposal. A staff of experienced South Wind Field Engineers is available to assist you with your specific pre-heating or heating problems. Write today for their help in adapting this or any other model in the complete South Wind line of heaters for commercial, military or civilian use. South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

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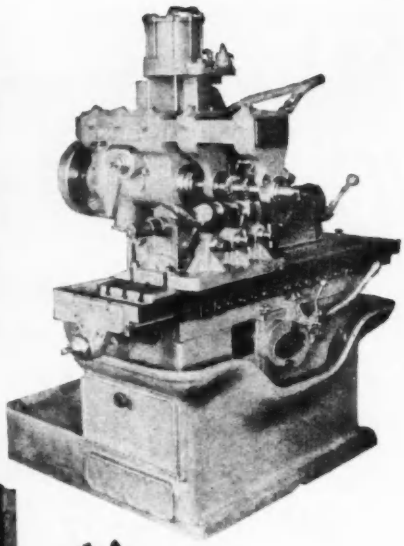
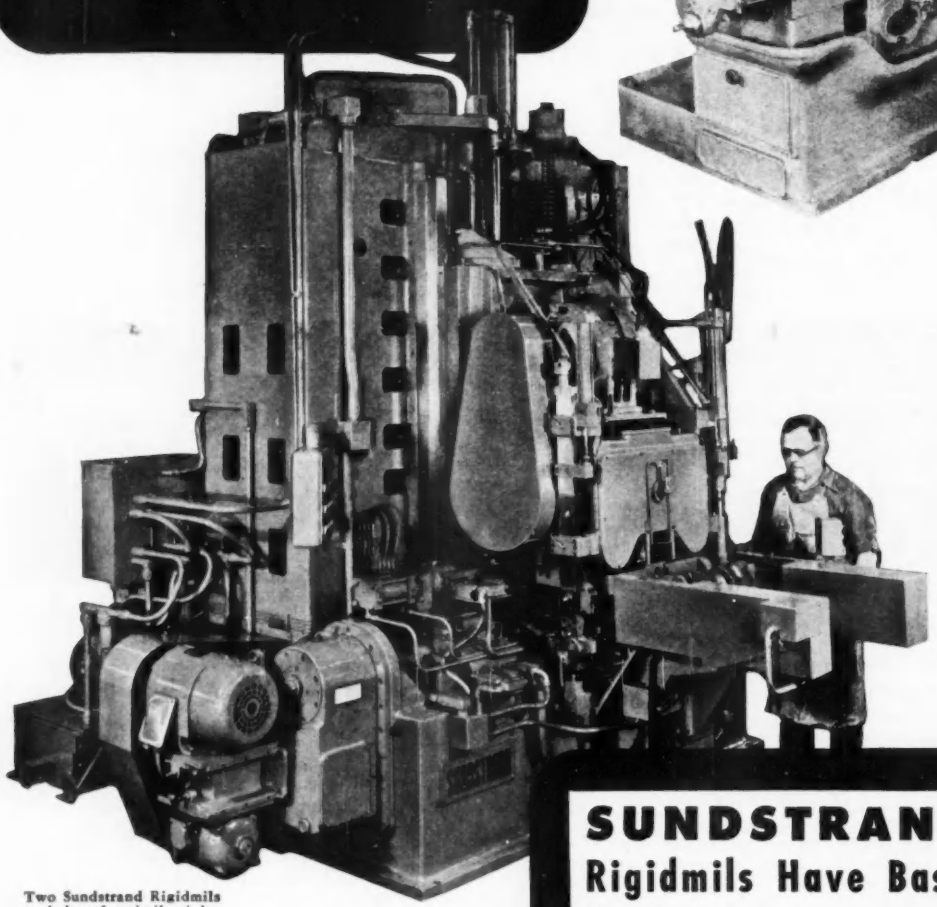
South Wind

AIRCRAFT HEATING AND THERMAL ANTI-ICING EQUIPMENT INERT GAS GENERATORS

Better Milling Methods and Improved Machine Design Increases Production from 12 to 96 Crankshafts Per Hour





Two Sundstrand Rigidmils tooled-up for similar jobs. Machine in background was designed and built in 1929. Machine in foreground is present day special Rigidmil.

SUNDSTRAND Rigidmils Have Basic Design Features to Improve Production

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

These two Rigidmils present another interesting picture of the progress made in machine tool design over a period of years. The machine in the background was built in 1929 for milling the ends of counterbalance seats on crankshafts. It is manually operated, mills one crankshaft at a time at the rate of 12 crankshafts per hour. The machine in the foreground mills the locating notches on both sides of an automotive crankshaft. This machine is also known as a rise and fall machine and aside from push button control is entirely automatic in operation. Production is 96 crankshafts per hour. Here are a few of the design features that make progress like this possible.

12 Rigidmil Design Improvements Make More Productive Methods Possible

Although the new machine shown on the opposite page is completely special, it also has some of the new design features listed below. These improvements are the results of our close work with industry in building efficient cost-cutting machinery to meet the ever present demands for progress. Some of the more important design improvements in Sundstrand Rigidmils are listed below. Check these against your present milling equipment.

1. ***Wider Speeds***
   Every Rigidmil has a wide selection of feed rates to accommodate various types of metals.
2. ***Wider Range of Feeds***
   to meet most production requirements in all types of metals.
3. ***Larger Quills***
   are provided to facilitate carbide milling with greater horsepower.
4. ***Heavier Heads For Greater H.P.***
   and to maintain greater accuracy at high production.
5. ***Larger Working Areas***
   to hold more parts or longer parts in one cycle.
6. ***Better Materials***
   used throughout all Rigidmils.
7. ***Hardened Steel Ways***
   to insure consistent accuracy in machining.
8. ***Climb Milling***
   to accommodate cycles where loading and unloading can be done while milling.
9. ***Automatic Lubrication***
   to cut down maintenance costs, simplify operator's duties.
10. ***Fast Rapid Traverse***
    to minimize non-cutting time of machine.
11. ***Larger Coolant Supply***
    to accommodate long periods of production machining.
12. ***Automatic Cycles***
    to minimize operator's duties and facilitate production milling.

FREE

Milling Methods

This book will give you many suggestions for production milling methods. Standard, semi-standard and special machine applications to milling problems are described in detail. Write for your copy today. Ask for bulletin 222.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2571 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

Special Sheet Aluminum For Automotive Radiators

A NEW aluminum alloy brazing sheet which should find use in automotive radiator development work has been brought out recently by the Aluminum Co. of America. This new product, No. XA30 Brazing Sheet, has a core metal of 3S alloy. One side of the core metal is clad with C43S brazing alloy to assure good joints, and the other side has an alclad coating which offers electrolytic protection to the core.

Construction

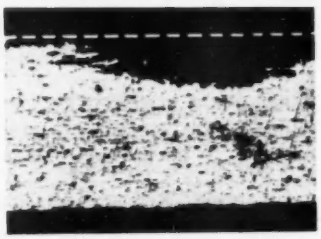
Based on Alcoa's research and development work, the dip brazing process appears to be the most desirable means for constructing radiator cores. Among the advantages of the dip brazing method of joining are controlled temperatures in the brazing range and the elimination of a separate fluxing operation. Usually the dip brazing process involves a brief degreasing operation with tricholorethylene (vapor degreasing), carbon tetrachloride or similar solvents. Castings or heat treated material should be chemically cleaned.

After cleaning, the assembly is preheated to 950-1000 F. Then the unit is dipped into molten flux at the proper brazing temperature. Normal brazing temperatures range from 1085 F to 1190 F. Length of time in the dip furnace depends upon the particular unit involved.

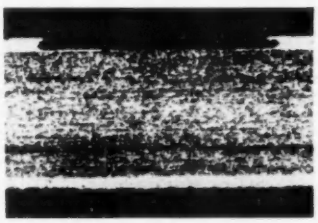
When the joining has been completed an operator removes the assembly from the furnace and drains

(*Turn to page* 110, *please*)

CORROSION TESTS



3S-H14



ALCLAD 3S-H14

These photographs at a magnification of 30 diameters (etch five per cent NaOH) show cross sections of 3S-H14 and alclad 3S-H14 sheet after exposure in sea water for 22 months. The corrosion of the 3S has penetrated perhaps a third of the way through the sheet whereas in the case of the alclad 3S the cladding has electrolytically protected the core causing the attack to spread out rather than penetrate into the 3S core. This same principle is used in the special cladding on No. XA30 Brazing Sheet.

HARDENED & GROUND PARTS
to exact specification
This spring pivot bolt typifies our machining versatility and strict adherence to specifications. Bolt is made from 1 7/16" high-carbon alloy steel hex bar stock; overall length, 5 5/8". Threads are precision cut, concentric with body diameter. After heat treating, threads are re-threaded to the specified pitch diameter. Bearing surface is ground to a fine micro-finish, ± .001 tolerance. The very latest equipment is used to make the knurling clean and sharp.
Brown Hardened and Ground Parts have served the automotive industry for over 40 years. Our specialty is precision machining, scientifically-controlled heat treating and micro-finish grinding. How can we serve you? Write or wire . . .
Experienced production on:
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . anything in the hardened and ground line, of any analysis steel, up to 4" .
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THE BROWN CORP.
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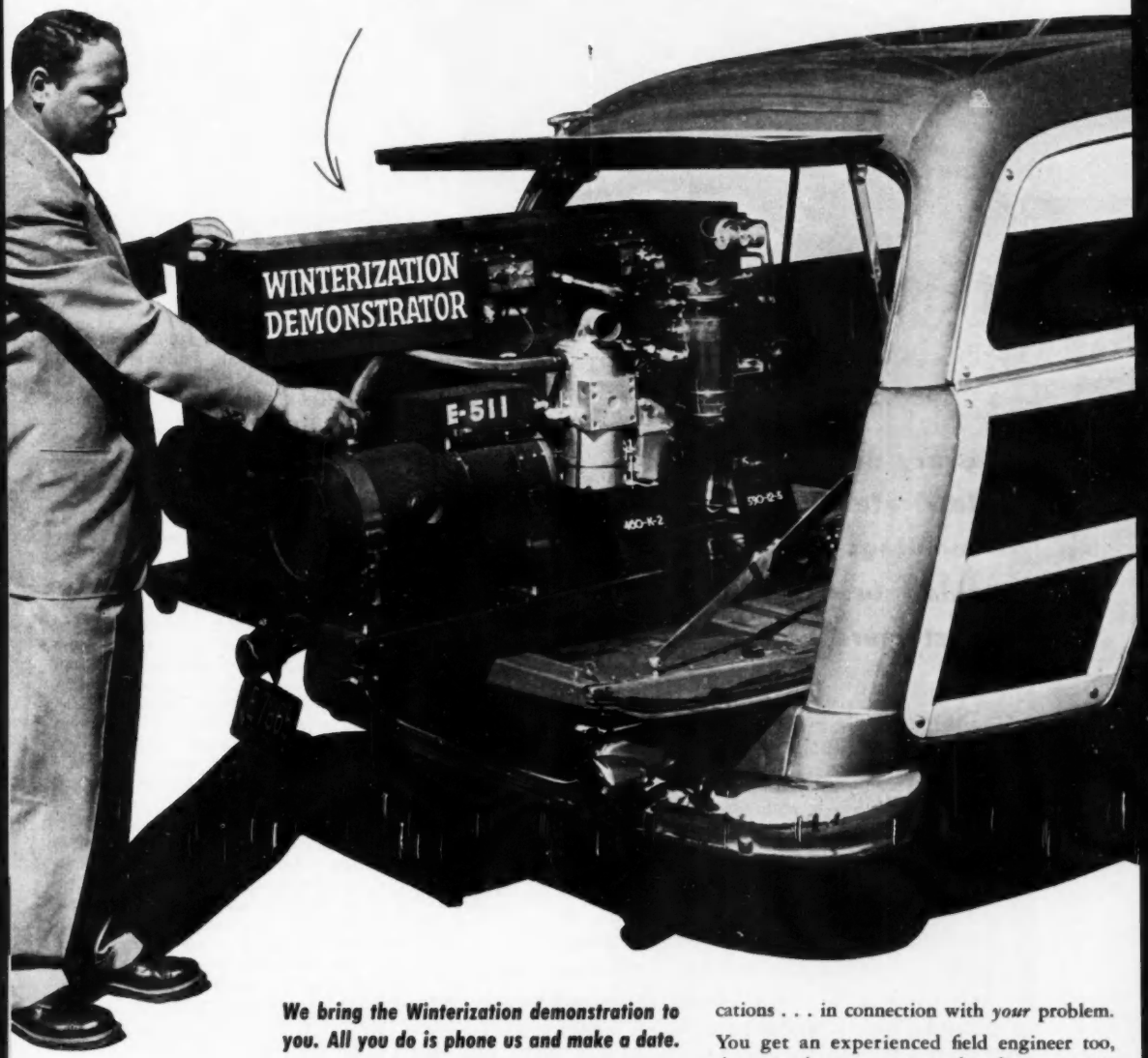
C. H. Elliott, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Belfour Rd., Detroit • R. C. Sanderson, 2809 N. Clark St., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Johns William & Co., 1440 N. Spring St., Los Angeles, Calif. • John B. Hunt, 8811 S.E. Yamhill St., Portland, Ore.

RIGHT AT YOUR DOORSTEP

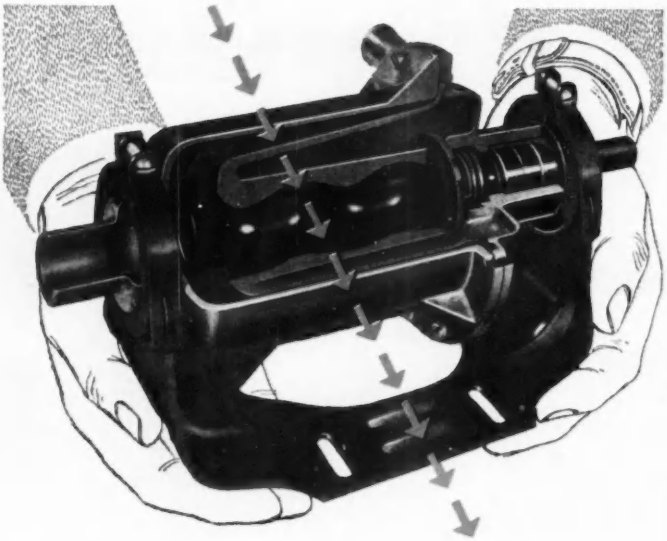


We bring the Winterization demonstration to you. All you do is phone us and make a date.

On Perfection's Mobile Demonstrator you can see five different types of heaters—which are the heart of our Winterization Systems—in actual operation. They include fresh air and coolant types ranging from 20,000 to 60,000 B.t.u. capacities. You can try them, pry into them, weigh the advantages of each . . . or modifications . . . in connection with *your* problem.

You get an experienced field engineer too, who can give you answers based on our 10 years of designing and producing winterization systems—over 100,000 installations—for all sizes and types of vehicles and equipment. Winterization Data File on request. Perfection Stove Company, 7376-D Platt Avenue, Cleveland 4, Ohio.

Perfection



every day we deliver intricate plastic moldings such as this into our customers' hands

PRP

This rotor on the pump of an automatic washing machine is the first such application of a plastic part. Mass production of the piece (tolerance of ± .003") gives our customer an appreciable savings in cost over the part previously used, an 80% reduction in weight, plus a wear-defying impact strength that results in maximum pump efficiency.

Whatever your peculiar problems in the design, engineering, production, assembly and delivery of *any* thermosetting part, P R P can help you . . . and has the facilities to place finished plastic pieces in your hands exactly when you need them. If you need the *extra* services available at P R P, just write or phone and we will have our plane bring you here for a discussion of your problem.

when you look for plastic moldings, look first to Plastic Research Products, urbana, ohio

Sheet Aluminum

(*Continued from page* 108)

the residual flux. As soon as air cooling permits, the unit is given a hot water rinse at 180-200 F followed by immersion in a nitric acid cleaning solution and a final cold water rinse.

The melting range for 3S is 1190-1210 F, while the melting range for C43S is 1070-1135 F. Brazing range for the composite No. XA30 Brazing Sheet is 1120-1140 F. The brazing material which is integral with the sheet forms good fillets and joints when it is used under the proper brazing temperature and flux conditions.

Resistance to Corrosion

The side of No. XA30 Brazing Sheet opposite the brazing alloy is an alclad coating which gives electrolytic protection to the 3S core metal. With the cladding any corrosion taking place does so only as far as the core and then spreads out. This action arrests further penetration for an extended period of time.

Aluminum Radiator Tests

Several different corrosion test methods have been used at Alcoa on the new No. XA30 Brazing Sheet. Accelerated corrosion tests were run and solution potential measurements were made with synthesized waters simulating the water of special areas of the country which might cause attack in aluminum radiators. Tests were conducted with water only and then with each kind of water in combination with varying percentages of anti-freeze compounds.

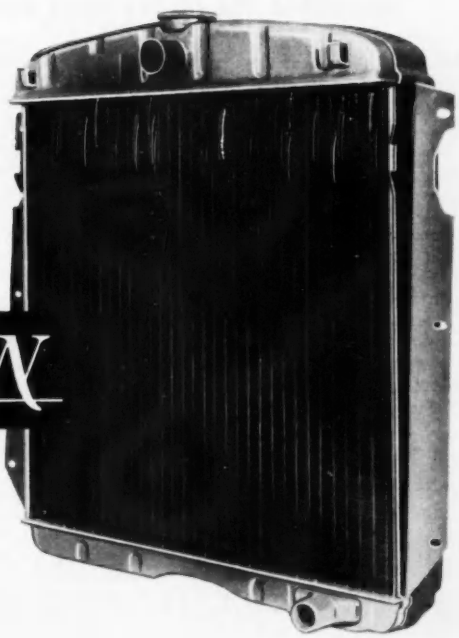
One water formulation had a significant concentration of heavy metal salts. Another had a relatively high chloride content. Both ethylene glycol base and alcohol base anti-freeze solutions were tested in this manner. Tests are said to indicate that corrosion by the coolant mediums described was not critical in No. XA30 Brazing Sheet.

Remaining Problems

Other problems remain to be solved before aluminum will be accepted as the standard material for automotive radiator construction. Questions which cannot be answered now because adequate service trials have not been completed are: will an inhibitor with coolant waters of different areas be necessary? Will an exterior paint coating be necessary to protect the radiator against road splash? Alcoa's development engineers are working to solve these problems now.

Harrison Radiators

An investment in good cooling



HARRISON

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION
LOCKPORT, NEW YORK

Here's the time-proved torque converter for heavy service

—a compact, efficient torque converter and fluid coupling available for heavy-duty engine and equipment manufacturers

ALLISON—builder of more than 10,000 Torqmatic Transmissions for military vehicles—offers American industry this proved torque converter. It enables heavy-duty equipment to get more work done faster—with less wear and tear on equipment and less operator fatigue.

A combination torque converter and fluid coupling, the new Allison TORQMATIC CONVERTER gives heavy off-highway trucks and other power machinery the smoothness and operating ease you enjoy with a hydraulic transmission in your car. It makes practical multiple engine installations in heavy vehicles.

The TORQMATIC CONVERTER multiplies torque automatically, providing an efficient balance between engine power and changing load demands. This eliminates engine lugging and stalling—permits the engine to operate in its most effective speed range.

It also prevents shock-loading of drivelines, cables, shafts, chains, gears and axles—reduces maintenance—lengthens equipment life.

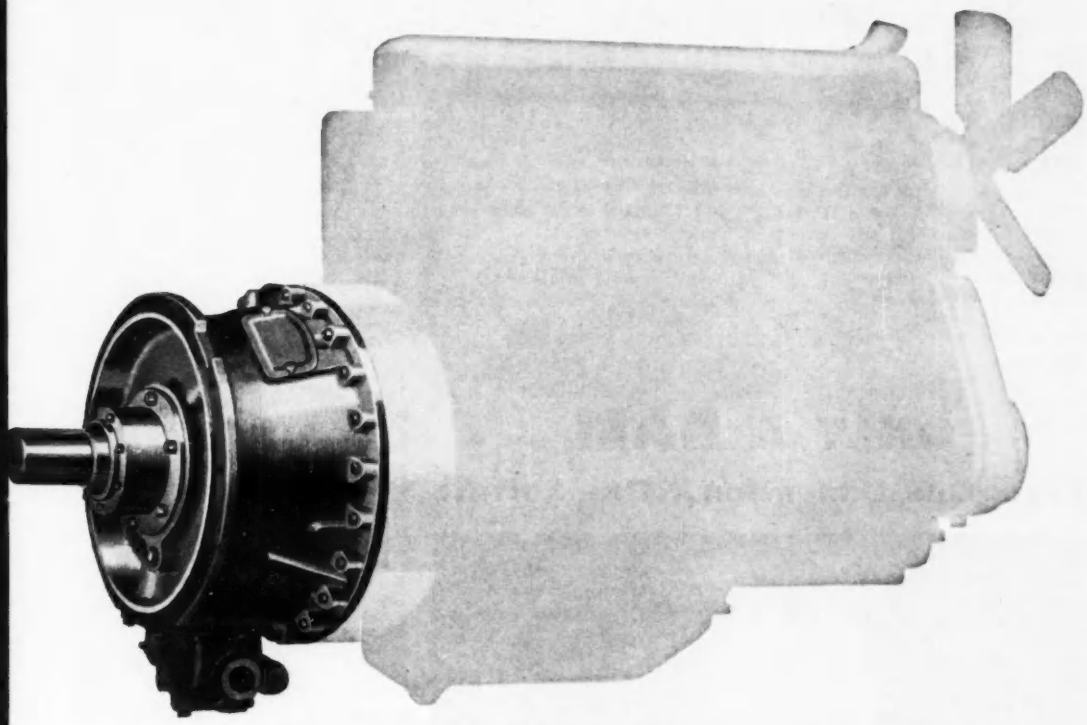
Wide Flexibility

Allison TORQMATIC CONVERTERS have been applied successfully with many engines in a variety of heavy-duty equipment—trucks, tractors, earth movers, industrial locomotives, rail cars, hoisting machinery, logging equipment, drilling rigs and pumps.

In each of these applications, the TORQMATIC CONVERTER has proved its ability to get the most work done in the shortest possible time.

Allison TORQMATIC CONVERTERS furnish ideal drives for heavy-duty engines delivering 75 to 350 horsepower. These compact units take no more space than a conventional, clutch-type, power take-off. For further information write to:

ALLISON DIVISION of GENERAL MOTORS
Box 894A, Indianapolis 6, Indiana



Here's how Allison Torqmatic Drive pays off:

More work output—eliminates "gearshift guess," multiplies torque hydraulically. Automatically balances engine power with changes in load demand.

Handles heavy loads—with shock-free, pinpoint control.

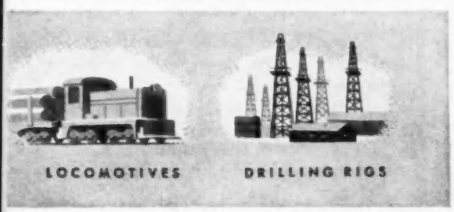
Longer equipment life—increases life of drivelines, axles, chains, sprockets and gears. Reduced wear and tear on equipment means higher availability.

Longer engine life—no engine lugging or stalling—reduces shock-loading on engine and components.

Few moving parts—simplified design with one-piece cast converter elements—easy to maintain.

Compact design—simplifies installation.

- Designed for power application from 75 to 350 h.p.
- Wide variety of models including industrial shafts, automotive type flanges, dis-connect clutches, lock-up clutches, output shaft governor drive.



GM GENERAL MOTORS

Allison
TORQMATIC DRIVES

News of the MACHINERY INDUSTRIES

(*Continued from page 57*)

Around the Industry

Fellows Gear Shaper has announced the appointment of George H. Sanborn as sales manager. He succeeds Leroy C. King who recently retired after 41 years with the company. Mr. Sanborn was previously the firm's Detroit district sales manager and chief field engineer.

The biennial Materials Handling Conference sponsored by Westinghouse will be held in Buffalo, N. Y., October 28 and 29. Bulk handling will be the major theme of the meeting with discussion centered around rigs, cranes, hoists, conveyors, and similar types of equipment.

Also during October—29 to 31—the American Institute of Electrical Engineers will hold their Fifth Annual Machine Tool Conference at Albany, N. Y.

Detroit's Bulldog Electric Products Co. is celebrating its 50th year in the manufacture of industrial electrical equipment, marked by a program of expansion, decentralization and product simplification. During the past year and a half, Bulldog's expansion program has seen the acquisition of two additional plants in the Harper-Piquette area in Detroit and two others in Urbana and Bellefontaine, Ohio. Another of the company's programs features over-the-counter selling of standardized panelboards which formerly had to be ordered and custom-built at the factory.

George H. Sanborn is now sales manager for Fellows Gear Shaper.

The nomination of Frederick S. Blackall, Jr., president and treasurer of Taft-Peirce Manufacturing Co., as 1953 president of The American Society of Mechanical Engineers, was announced recently by the Society.

Mr. Blackall heads a slate of new ASME nominees, including four regional vice presidents and two directors-at-large, submitted by the Society's nominating committee. Since only one name is presented for each office, nomination is tantamount to election.

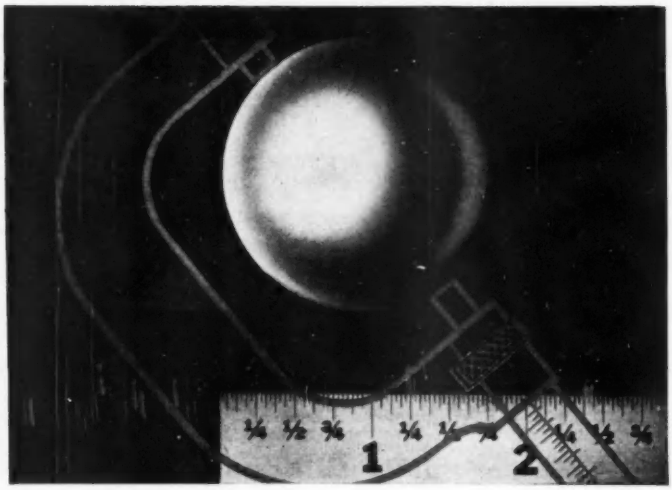
GM Releases Booklet on Measuring Devices

"Precision — A Measure of Progress," a new educational booklet recently released by General Motors Corp., traces the development of measuring devices from ancient times to today.

The 63-page booklet, with 59 illustrations in color, is available in limited quantities to teachers in schools and colleges, libraries, and other educational institutions. Requests should be addressed to General Motors Educational Relations Activity, Detroit 2, Michigan.

ONLY A BALL

has...One Dimension...One Surface



but oh—how important

Important not only in precision ball bearings, but also in the lot of other applications where Strom metal balls have been doing the job better. Strom has been in on a great many ball-application problems, and knows how important these two factors are for the best results.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

Strom STEEL BALL CO.
1850 So. 54th Ave., Cicero 50, Illinois
Largest Independent and Exclusive Metal Ball Manufacturer

AEROQUIP SELF-SEALING COUPLINGS

AND FLEXIBLE HOSE LINES

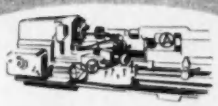
Speed Maintenance

WHEREVER FLUID-CARRYING LINES
MUST BE DISCONNECTED AND RECONNECTED

BUSES AND TRUCKS

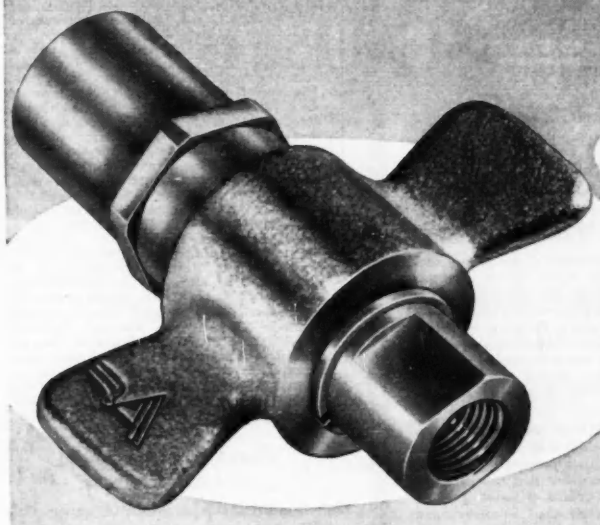
RAILROADS

OIL FIELD DRILLING RIGS



MACHINE TOOLS

MATERIALS HANDLING TRUCKS



Speed maintenance, *speed* repair operations and *speed* interchanging of accessories joined by fluid-carrying lines with Aeroquip Self-Sealing Couplings. Lines may be separated in a few seconds without loss of fluid. No air enters the system upon reconnection. There is no need to drain or prime the fluid system. One Self-Sealing Coupling takes the place of two shut-off valves.

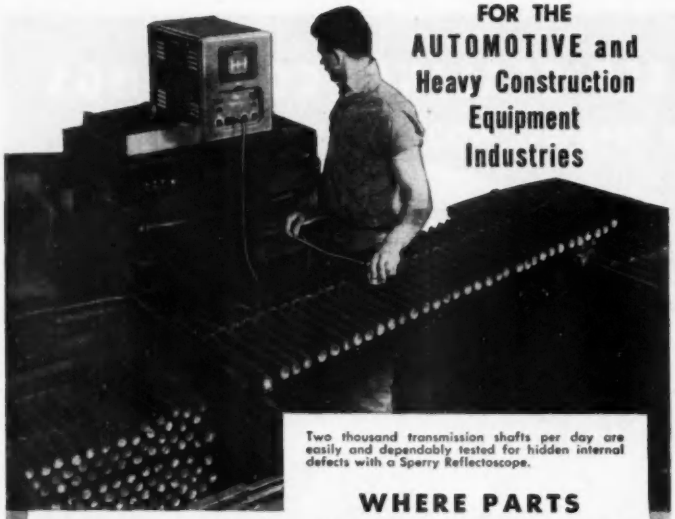
Aeroquip

REG. U.S. PAT. OFF. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA. MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD



FOR THE
AUTOMOTIVE and
Heavy Construction
Equipment
Industries

Two thousand transmission shafts per day are easily and dependably tested for hidden internal defects with a Sperry Reflectoscope.

WHERE PARTS
MUST NOT FAIL
THE Sperry
ULTRASONIC
REFLECTOSCOPE
PROVIDES FAST, DEPENDABLE
100% TESTING

A huge kingpin is tested for flaws through its entire length.

Reflectoscope testing this steering gear will reveal any hidden defects in the metal or in the weld where the two ends are joined.

AUTOMOTIVE INDUSTRY: A dangerous accident caused by the failure of an important part would seriously damage the reputation of an automobile manufacturer. For this reason, the Malloy Manufacturing Company of Detroit — producers of COLD FORGED steel transmission shafts for two major automobile corporations — rely on Sperry Reflectoscope testing to eliminate the possibility of hidden defects in their product.

HEAVY CONSTRUCTION EQUIPMENT: The "Tournarocker", manufactured by R. G. LeTourneau, Inc. of Peoria, is a powerful, high-speed, materials-handling machine that can carry 18 tons fully loaded. Capable of traveling at 35 m.p.h., it is extensively used wherever huge amounts of material must be moved. As any parts failure on-the-job would, obviously, be dangerous and cause costly delays, the Le Tourneau Company looks to Sperry Reflectoscope testing to assure that nothing but defect-free axles, gears and kingpins are incorporated in the "Tournarocker".

Learn how you can reduce testing costs and improve quality control in your plant. Write today for complete information about the Sperry Reflectoscope . . . for sale, or for lease. Ask about Sperry's day to day Testing Service.

Sperry
SPERRY PRODUCTS INC.
208 SHELTER ROCK ROAD
Danbury, Connecticut
REPRESENTATIVES IN PRINCIPAL CITIES

BOOKS . . .

THE AUTOMOTIVE CHASSIS (Without Powerplant), Third Edition by *P. M. Heldt*, published by *P. M. Heldt, Nyack, N. Y.* This book covers frames, springs, axles, wheels, tires, drives, steering gears, brakes, universal joints, differential gears, and miscellaneous parts. The volume has been brought up to date with the latest developments in the design of the automotive chassis by the addition of numerous new illustrations and a corresponding amount of new text. Power steering and power braking are just two of the many new developments explained. A chapter on "Power Required for Propulsion and Acceleration" has been largely rewritten to bring it in line with recent experimental results.

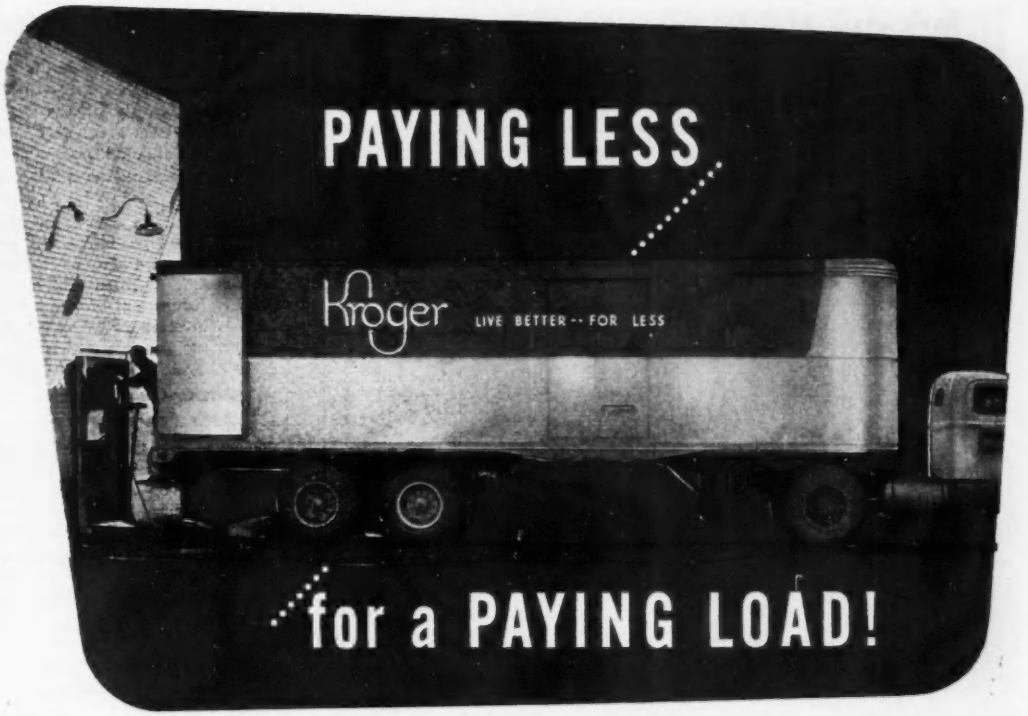
KRAEFTE IN DEN TRIEBWERKEN SCHNELLAUFENDER KOLBENKRAFTMASCHINEN (Forces in the Crank Trains of High-Speed Piston Engines) by *G. H. Neugebauer. Second edition. Published by Springer Verlag, Berlin, Germany.* This is one of a series of "Design Books" published under the editorship of Professor Dr.-Ing. E. A. Cornelius of Hamburg. Its author is connected with the Nuernberg Works of M.A.N. and undoubtedly has an excellent background for dealing with problems of crank-train design and calculation. The following list of chapter heads gives a good idea of the contents: General Considerations Relating to the Choice and Calculation of the Principal Dimensions of the Crank Train—Determination of the Weight, the Moment of Inertia, and the Center of Gravity of Crank-Train Parts—"Reduction" of Masses and Forces—Determination of Piston Travel, Piston Velocity, and Piston Acceleration—Determination of Forces in the Crank Train of a Single-Cylinder Engine and Application of the Method to Multi-Cylinder Engines—Investigation of Engine-Speed Fluctuations and Calculaiton of Flywheel Dimensions — Inertia Forces and Moments in Piston Engines and Methods of Balancing Them or Reducing Them to the Minimum —Calculation of Bearing Loads—Calculation of Crank-Train Forces, Flywheel Weight, and Speed Fluctuations for an Eight-Cyl Vee Engine. The book quite naturally is rather mathematical in character, but graphical methods are used to a considerable extent in the determination of unbalanced forces and moments.

Bogue Electric Builds Third Plant in N. J.

Bogue Electric Manufacturing Co. is building a new plant, its third in Paterson, N. J. The new plant will add 25,000 sq ft of additional floor space and will be used for offices, engineering, and manufacturing.

Artisan Metal Sets Up Metal Coating Branch

Artisan Metal Works has announced the establishment of a new subsidiary company, known as Clevecote, Inc. This concern will specialize in the coating of metal surfaces with a silicone glaze, a process developed by Dow Corning Corp., and employing equipment and cleaners manufactured by Detrex Corp.



To the Executive Planning for TOMORROW...

Aluminum trailers weighing as much as 4000 pounds less than standard steel models mean increased payloads, fewer trips. That's why one of America's great food distributors, the Kroger Company with more than 1100 aluminum trailers in its fleet, adopted aluminum as long ago as 1935.

Kroger reports that to date not a single all-aluminum trailer purchased by them has ever actually worn out! Proof of their satisfaction is reflected in the fact that they have ordered almost 200 more of these units from the Highway Trailer Company of Edgerton, Wisconsin in the past two years.

Highway Trailer engineers and Kroger transportation experts work very closely in designing these trailers to meet Kroger's exacting specifications. In turn, the knowledge and experience of Reynolds Aluminum Specialists assure both *manufacturer* and *consumer* maximum benefits from strong, lightweight aluminum.

Kroger finds that non-rustable aluminum cuts maintenance and service costs. High reflectivity of aluminum keeps interiors cooler . . . an important factor in hauling perishables. And the *saving in weight* allows greater payloads . . . means substantial savings per mile traveled.

If this example of the advantages of aluminum suggests a way to improve *your* product, call the Reynolds Aluminum Specialist in your area. He will be glad to work with you in planning and designing for your future with aluminum. Look under "Aluminum" in your classified telephone directory. Or, write Reynolds Metals Company, 2587 South Third Street, Louisville 1, Kentucky.

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

Industry News

(*Continued from page* 24)

Barium Steel Acquires East Coast Aeronautics

Barium Steel Corp. announced recently that it had acquired all of the outstanding shares of East Coast Aeronautics, Inc., in exchange for 27,401 shares of its capital stock and $950,000 in three-year serial notes.

East Coast Aeronautics is a designer and fabricator of new materials such as magnesium, aluminum, and fiberglas as directly applied to the aircraft, marine, and construction fields. It is currently building wings for service testing for the Air Force and Navy, as well as an all-magnesium plane for the former.

Army Plans Greater Use of Commercial Vehicles

Substitution of commercial for more expensively built tactical vehicles has been adopted in certain types of units as a general policy in order to save money, the Dept. of the Army announced recently.

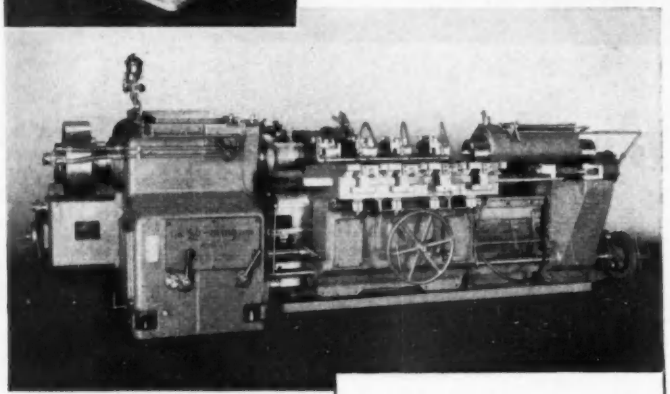
At present, the plan is being put into effect in all antiaircraft artillery units stationed in the U. S. and not scheduled to be sent overseas, as well as in administrative and rear-echelon units overseas and in the continental U. S.

It is planned to substitute commercial vehicles gradually as new units are activated and as tactical carriers become worn out. No sudden and mass procurement of commercial vehicles is involved at this time, according to the Army.

PROVED ON ORDNANCE WORK

Lo-swing IMP, proved on 40 mm shells and small Ordnance Parts.

Model LS *Lo-swing* proved on 105 mm Gun barrels, and 220 and 240 mm Shells.



DURING WORLD WAR II *Lo-swing* Lathes demonstrated their productiveness and stamina on a wide range of Ordnance Work . . . 40, 75, 90, 105, 155, 220 and 240 mm Shells—50 and 81 mm Trench Bombs—20, 40 and 105 mm Gun Barrels—camshafts, cylinder sleeves, radial aircraft cylinders, landing struts, large diesel engine cylinders, etc. The Model CS Centering Machine was used extensively on 75, 90 and 105 mm Shells. Now, once again, Ordnance Manufacturers are calling on *Lo-swing* engineers for competent assistance. Can we help you?

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

- *Lo-swing* IMP Lathe. Fully automatic, for small diameter work at high speeds.
- Model LR *Lo-swing* Lathe. Fully automatic, for medium sized work.
- Model AR *Lo-swing* Lathe. Fully automatic, for medium and large size work.
- Model R-14 *Lo-swing* Lathe. Fully automatic, for large size work.
- Model AP *Lo-swing* Lathe. Semi-automatic, for work requiring long carriage travel.
- Model LS *Lo-swing* Lathe. Semi-automatic for turning long gun barrels and heavy shells up to 13" in diameter.
- Model CS Drilling and Centering Machine. Fully automatic for all centering operations.

Lo-swing **AUTOMATIC LATHES**

Ditzler Celebrates 50th Anniversary

Commemorating fifty years of service to the automobile industry, Ditzler Color Div. of Pittsburgh Plate Glass Co. recently held an open house at its plant in Detroit, Mich. Over 1200 persons toured all departments in the eleven-acre plant to observe how automobile colors and finishing materials are made.

American Radiator Units Were Recently Combined

Kewanee Boiler Corp. and Ross Heater & Manufacturing Co., Inc., two divisions of American Radiator & Standard Sanitary Corp., have combined to form a new company, Kewanee-Ross Corp. Both units will continue to operate as before, maintaining their respective plant locations, sales offices and representatives.

Jack & Heintz Build New Tank Generator

Jack & Heintz, Inc., soon will be in mass production of a new generator for Gen. Patton and Gen. Pershing tanks.

The new generator was reportedly developed by the company's engineers to provide adequate power at low engine speed to operate turret controls, communication system, and other electrically operated equipment. The new unit is a 300-amp, 30-v model, and is said to supply adequate output even when tank engines are idling.

Westinghouse Lamp Dept. to Move to Kentucky

The Special Miniature Lamp Dept. of Westinghouse Electric Corp.'s Lamp Div. will be moved from Bloomfield, N. J., to Richmond, Ky. The move is expected to be completed by mid-summer.

(*Turn to page* 120, *please*)

HERE'S THE "IRON MAN" of the steel construction business!

Elmes Hydraulic Bulldozer

Shown in operation is a 200-Ton Elmes Hydraulic Bulldozer, working in the shop of one of the country's larger steel construction companies. This customer reports his Elmes Bulldozer *"has been busy without interruption since it was installed . . . has performed a tremendous amount of bending and straightening work . . . turned out a greater number of pieces than ever anticipated."*

There are sound reasons why Elmes Hydraulic Bulldozers receive such enthusiastic recommendations. They're built rugged for rugged work — heavy bending, forming, straightening. Bed and frame are of simplified, solid design, using bolted and keyed construction of structural steel. And the design is *clean*. Top of the press is clear—free from obstructions. Pumping unit is located low, at the end of the press. The press is protected. You can bring work to the press—position it quickly, from an overhead traveling crane. Head is adjustable for varying the work space opening.

Elmes Hydraulic Bulldozers are available in capacities up to 500 tons, with bed size, stroke and speed optional to suit your requirements. Your Elmes distributor can give you full details on these versatile presses and on the complete line of Elmes Hydraulic Metal-Working Presses. See him now—or write us for Bulletin No. 1010 B.

American Steel Foundries

ELMES ENGINEERING DIVISION

Industry News

(*Continued from page* 118)

U. S.-British Car Taxes Are Compared for Year

Taxes paid in Great Britain on British automobiles and fuel will yield the government an estimated $856 million during 1952-53, according to the Society of Motor Manufacturers & Traders, British automotive trade association.

Gasoline in Britain is taxed 35 cents per gallon, compared to slightly more than 7 cents per gallon in New York, the Society stated. A car owner driving 10,000 miles a year, and keeping his car for eight years, will pay taxes of $220.50 annually in Great Britain, compared to some $45.00 yearly tax in New York by an owner driving the same distance. These figures include taxes on gasoline consumed each year, and the original purchase tax on the car.

New car buyers in Britain must pay a purchase tax of 66 per cent. Thus a car listing at $2000 would be taxed some $1332, costing the buyer $3332. Of a total production of some 450,000 cars (estimated) this year, only 60,000 will be sold in the home market, the remaining 390,000 being exported to world markets.

Auto-Lite Opens Service Schools

Two new service schools will be operated this summer on the West Coast as Electric Auto-Lite Co. continues its policy of giving personnel of its Service Div. more training.

One school is now in operation at Seattle, Wash., and another will be opened to students later this summer in San Francisco, Calif. Both schools are open to employees of Auto-Lite service accounts.

White Announces Chassis for Heavy-Duty Needs

A new model Sterling-White chassis, developed for oil field operations and other heavy-duty services, has been announced by White Motor Co.'s Sterling Div.

This Model SB 3255D is said to be engineered for the handling of drilling rigs and other heavy oil field machinery. Variations of this model are also available for logging and other heavy-duty off-the-road operations.

A 200-hp Diesel engine provides the power for this new model. Dual transmissions, a four-speed main and three-speed auxiliary, are provided.

British Speed Work on Guided Missiles

Alongside production of aircraft for the military services, an increasingly large section of the British aircraft industry is said to be at work on guided missiles.

Companies already named as working in this field are: Bristol, de Havilland Propellers, English Electric, Fairey Aviation, Hawker Siddeley Group, and Vickers-Armstrong. Production of gudied missiles has been rated as "super-priority."

Rigidized Metals Extends Customer Service Policy

Rigidized Metals Corp. announced recently that it is extending its engineering and metallurgical services to aid client design engineers in the preparation of special metal patterns to fill a precise end use. The company is said to offer all ferrous and non-ferrous metals in solid or perforated, sheet or strip, and coils or cut lengths.

VULCAN has the special coated fabric DIAPHRAGMS

FOR AUTOMOTIVE AND AIRCRAFT CONTROLS

Wherever component design requires actuating diaphragms or synthetic rubber coated fabrics having special properties, VULCAN has the knowledge and facilities to solve the problem.

Leading equipment manufacturers choose VULCAN diaphragms and fabrics for such applications as

- Fuel Pumps
- Carburetors
- Instrument Diaphragms
- Dashpot Mechanisms
- Vacuum Booster Pumps
- Fuel Metering Controls
- Hydraulic and Pneumatic Control Mechanisms

Fabrics available in a wide range of specifications as to base fabric, gauge and properties of coatings. Highly resistant to gasoline, oils, aromatics, alcohols, butane, propane and solvents. High heat and cold resistance.

Bring us your problems. Our engineers will work with yours. Write for literature.

VULCAN RUBBER

PRODUCTS, INCORPORATED

58th Street and First Avenue • Brooklyn 20, N. Y.

HOW G-E SILICONES OFFER YOU

IMPORTANT SAVINGS THROUGH NEW DESIGN POSSIBILITIES

Lighter, more compact design! G-E silicones (resin SR-98) in Class H insulation made possible a 25% saving in critical copper in the redesign (right) of this atomic-hydrogen welder. G-E silicone insulation permits the welder to operate at higher temperatures—provides exceptional resistance to moisture and chemical fumes. Use coupon for more data on SR-98!

Here's an opportunity to save time, money and materials! Take advantage of the new design possibilities offered by General Electric silicones. For example, new Class H insulation made with G-E silicones permits drastic reductions in the size and weight of aircraft autotransformers. G-E silicone rubber makes possible longer-lasting jet engine seals, diesel gaskets and aircraft ducting.

WHAT CAN G-E SILICONES DO FOR YOU?

New design possibilities of silicones are suggested in an informative booklet *The Silicone Story*. Why not write for a copy today? In it you may find the key to improving a product or process . . . possibly even a clue to making an entirely new product! Just mail the coupon.

THE FOUR BASIC PROPERTIES OF G-E SILICONES

Resistance to temperature extremes
Inertness to metals, rubber, many chemicals
Release from sticking
Unusual surface characteristics

General Electric Company
Section 132-6A
Waterford, New York

☐ Please send me a free copy of *The Silicone Story*.
☐ Send me product data on SR-98.

Name_____
Firm_____
Street_____
City_____ Zone___ State_____

(In Canada, mail to Canadian General Electric Company, Ltd., Toronto.)

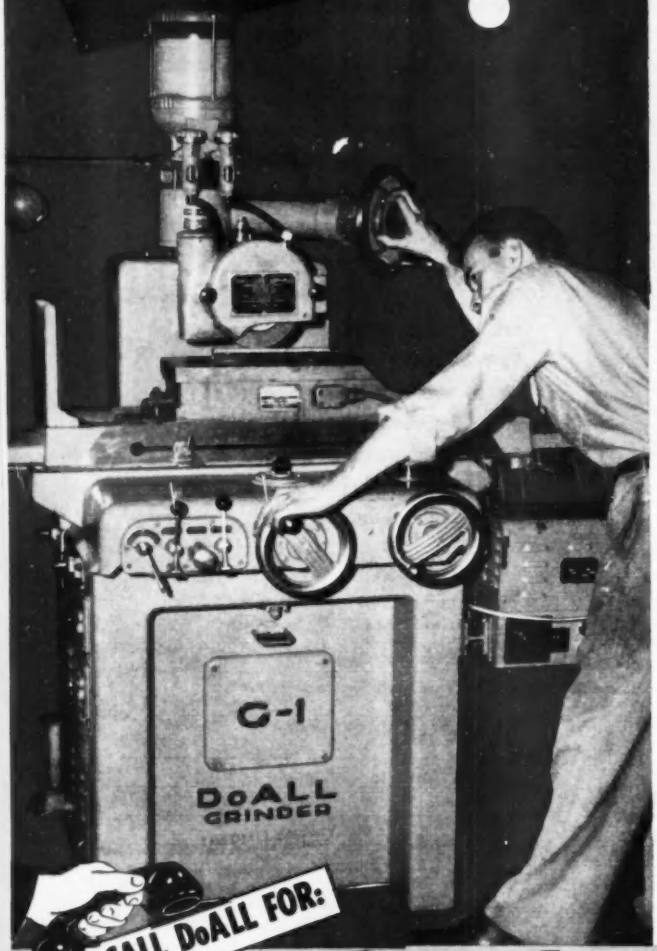
G-E SILICONES FIT INTO YOUR FUTURE

GENERAL ELECTRIC

131-6

CAN YOUR SURFACE

Will they take the EXACT depth of cut for which you set the Down-Feed Handwheel ?



HERE'S a way to put a grinder through its paces—to find out if its got what it takes! Handwheel graduations in ten-thousandths don't mean a thing unless the wheel will obey the setting.

DoALL Precision Hydraulic Surface Grinders will take a cut that is right on the nose because they are rigid and rugged and machined to exacting perfection. The vertical column is 30 inches long to reduce misalignment to microscopic proportion. There is an automatic take-up on the spindle bearings to compensate for wear and temperature change. The frame is massive with a single-piece column support and base. The husky spindle support is dowelled and bolted to the column.

You have to see a DoALL Grinder perform to believe it—see it take .010" cuts with .010" crossfeed in high chrome, high carbon steel true to the down-feed setting in one pass.

Let your local DoALL Sales-Service store demonstrate a DoALL Grinder right in your own plant. There is no obligation.

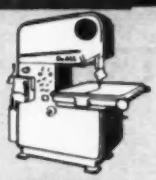
THE DoALL COMPANY
254 N. Laurel Ave.
Des Plaines, Illinois

Ask For Grinder Catalog

. . . complete information on the complete line of DoALL Grinders for toolroom and production work.

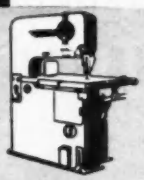
*Patent No. 2470350

CALL DoALL FOR:



CONTOUR-MATIC

ZEPHYR



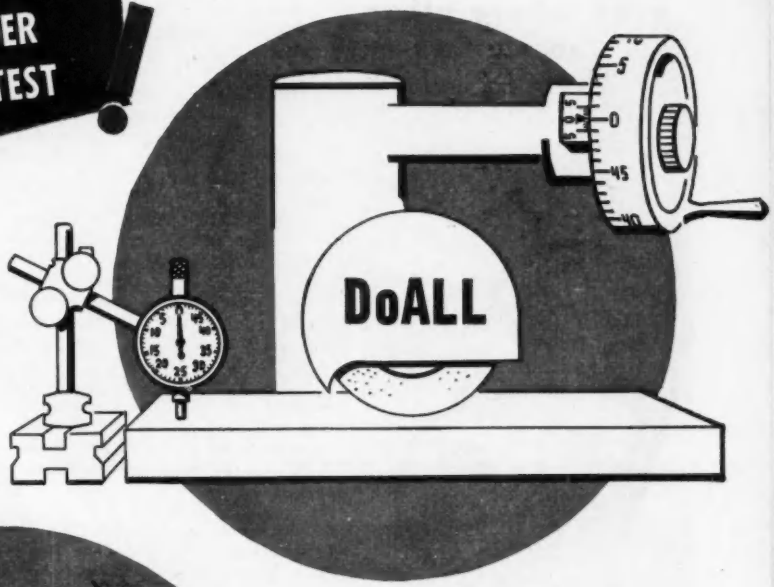
CONTOUR

BAND FILER

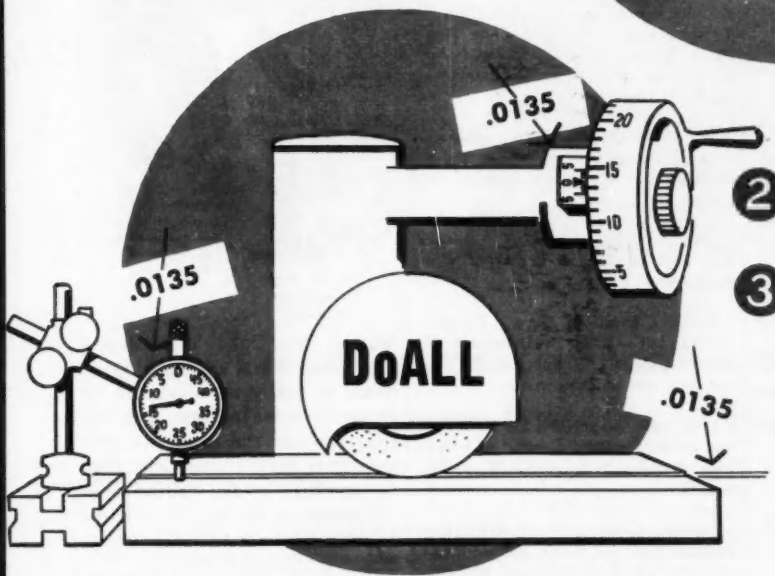
SAW BANDS

GRINDERS DO THIS?

A DoALL PRECISION SURFACE GRINDER WILL PASS THIS TEST



1 **SET THE HANDWHEEL** to remove .0135" of stock. Position a dial test indicator at zero reading on the work surface.



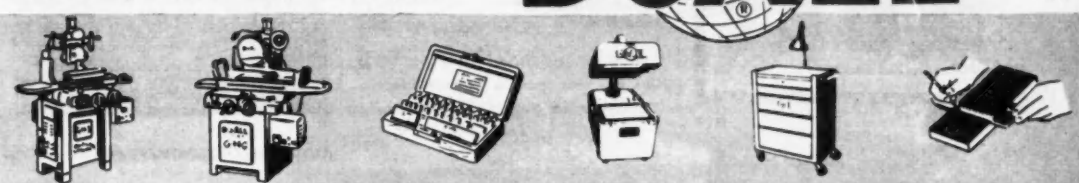
2 **GRIND THE PIECE.**

3 **CHECK THE MATERIAL** to see if exactly .0135" has been removed. If you did the job with a DoALL Grinder the dial indicator will now show the work surface exactly .0135" lower than before grinding.

ONLY DoALL OFFERS "COOL-GRINDING"
With the DoALL "Cool-Grinding" attachment on DoALL Surface Grinders, coolant flows through the wheel and out at point of contact of wheel and work in a fine mist. Temperature at point of contact is reduced as much as 400°F. Faster, heavier cuts can be taken without burning or other damage to work piece.

DoALL

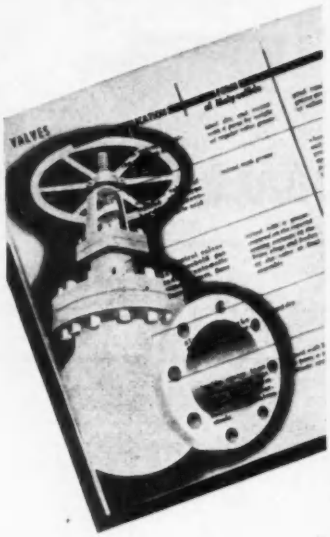
GR-7



TOOLROOM GRINDER | CRUSH GRINDER | GAGING EQUIPMENT | MONOLITE | MOBILE INSPECTION UNITS | TOOL STEEL

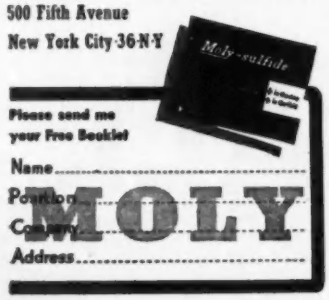
Moly-sulfide
A LITTLE DOES A LOT

is proving effective even where other lubricants have failed



Moly-sulfide, a solid-film lubricant, is proving so useful in difficult friction applications that new uses are found daily. 154 cases of how serious problems were solved are described in our new booklet. Your own problems may be like those described. Write for your copy of this booklet.

Climax Molybdenum Company
500 Fifth Avenue
New York City 36 N.Y.



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MEN *in the* NEWS

(*Continued from page* 25)

General Tire & Rubber Co.—**John C. Ink** has been named controller of sales and distribution costs.

American Brake Shoe Co., Brakeblok Div.—**J. D. Hinton** is now assistant manager of equipment sales, and **R. L. Berry** is manager of ABK laminated plastic sales.

General Electric Co.—**J. M. Bertotti** is manager of the new Personnel Practices Dept.

General Motors Corp., GMC Truck and Coach Div.—**R. C. Woodhouse** has become general sales manager.

Fellows Gear Shaper Co. — **G. H. Sanborn** was recently named to succeed **L. C. King**, retired, as sales manager. **H. B. Flinn** succeeds **D. T. Hamilton**, also retired, as publicity manager.

Gould-National Batteries, Inc. — **Fred H. Harris** has been made assistant general sales manager, while **O. K. Deacon** was named industrial engineer.

Purolator Products, Inc.—**Edward S. Kastner** has been appointed superintendent of the new Ringtown, Pa., plant.

Van Norman Co.—**C. R. Crowder** has been appointed executive vice-president.

Bendix Aviation Corp., Pioneer-Central Div.—**E. E. Burks** is now assistant general manager. **G. F. Rau** succeeds him as comptroller.

Chrysler Corp. — **W. D. Merrifield** was recently named director of industrial education to succeed **J. M. Amiss**, retired.

General Electric Co., Aircraft Gas Turbine Div. — **W. O. Meckley** was recently named manager of engineering and **H. M. Wales** manager of sales for the new accessory turbine organization at the Lynn River Works. Other appointments were: **T. N. Ferren**, superintendent of manufacturing; **F. W. Dahlberg**, facilities engineer; **J. W. Shirley**, production manager; and **A. C. Eastman**, supervisor of inspection.

R. M. Hollingshead Corp. — **T. H. Risk** has been made a vice-president.

(*Turn to page* 126, *please*)

WITTEK

NOC-OUT HOSE CLAMPS

The Standard of the Automotive Industry

Type A—Radiator Hose Connections

Type G-BB—Booster Brake Hose Connections No. G-B-HH for Hot Water Heater Hose

Type HP—High Pressure Hose Connections

Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

Write for descriptive literature.

Automotive HOSE CLAMPS
WITTEK MANUFACTURING CO.
4319 W. 24th Place, Chicago 23, Ill.
Dependability in Hose Clamps for Over a Quarter of a Century

Another new development using

B. F. Goodrich Chemical *raw materials*

Seal made by Roth Rubber Co., Chicago, for Vapor Heating Corp., Chicago. B. F. Goodrich Chemical Co. supplies the Hycar rubber only.

Hot steam handled from coach to coach —WITH HYCAR'S HELP!

THAT flexible, metallic conduit pictured has a rough, tough job —carrying steam heated to 400°F., under 250 pounds pressure, for heating railroad coaches.

Connected between cars, it has eight swivel joints to absorb jolts when the train rolls along. A seal at each joint must withstand the hot steam and vibration. And the seal manufacturer found that one made of Hycar, faced with asbestos, met all the severe requirements.

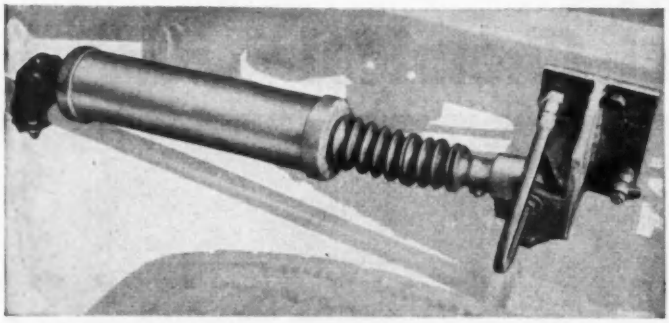
A natural choice, too, for Hycar has advantages that make it ideal for rugged service like this. Hycar rubber compounds can be made resistant to heat and cold, yet remain flexible and resilient under extreme temperatures. Hycar also resists water, weather, abrasion . . . gas, oil, many chemicals and more damaging factors.

Hycar may be the answer to your product development or improvement problems—the way to better, more saleable products. For helpful technical information on Hycar rubber compounds, please write Dept. HG-8, B. F. Goodrich Chemical Co., Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ont. Cable address: Goodchemco.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



Air-O-Matic Power Steer Booster installed on White Truck Model 3022e4

AIR-O-MATIC *AIR POWER STEERING*
for
SAFE STEERING ASSIST

A self-contained unit, easily installed. Only one air line required. Low initial cost and maintenance.
Used by manufacturers of trucks, tractors, Moto-Cranes, off-the-road equipment, Military and other vehicles.
Technical information furnished upon request.

AIR-O-MATIC POWER STEER CORP.
24 Noble Court N. W. Cleveland 13, Ohio

MEN *in the* NEWS

(*Continued from page* 124)

Republic Aviation Corp. — **D. K. Tasker** is now executive assistant to the vice president and assistant general manager.

Caterpillar Tractor Co.—**Robert W. Miller** has been elected a director.

Heli-Coil Corp.—**Paul E. Wolfe** has been appointed applications engineer.

Bakelite Co.—**John D. Benedito** was recently appointed manager of the new Molding and Extrusion Materials Dept. **David A. Munns** has been named division manager within the dept.

General Controls Co.—**Fred Weldon** is now company sales manager and manager of the new Skokie, Ill., factory.

J. N. Fauver Co.—**Carl S. Abbott** has become vice president and general manager, while **John W. Fauver** has been named vice president and sales manager.

Philco Corp., Government and Industrial Div.—**Gerard E. Nistal** has been appointed advertising and sales manager.

Worthington Corp.—**Ralph M. Watson** was recently named director of research.

Allis-Chalmers Manufacturing Co., Tractor Div.—**Willis G. Scholl** has been elected vice president in charge of this unit, while **Frank Mussell** succeeds him as vice president and general sales manager.

Illinois Tool Works—**Austin E. Cole** is now vice president and treasurer, while **Bernard H. Regenburg** and **J. R. Russell** have been chosen secretary, and assistant secretary and assistant treasurer, respectively.

Clevite Service, Inc.—**Raymond Z. Oswald** has been made president, with **Gilbert M. Salzman** as vice president. Other officers of the new firm are: **A. M. Currier, Jr.**, general sales manager; **Wade O'Brian**, comptroller; **C. A. Dilley**, secretary; and **K. M. Leighton**, assistant secretary.

Ford Motor Co., Lincoln-Mercury Div.—**Richard E. Krafve** is now assistant general manager.

Gar Wood Industries, Inc., Wayne Div.—**C. J. Berini** has been made manager with **H. D. Chicoine** as his assistant.

Twin Coach Co.—**Robert W. Jones** is now field service manager, while **Walter C. Smart** heads the Motor Vehicle Div. **C. J. Felton** has become manager of the Service Replacement Parts Div.

B. F. Goodrich Co., Associated Tire and Accessories Div.—**Fred C. Schulz** was recently named Pacific Coast manager, while **Don W. Gates** and **Grover C. Clark** are now merchandising manager, and advertising and sales promotion manager, respectively.

Republic Hardfacing Corp.—**Ray A. Mentel** has been made vice president and general manager and **Gorham W. Woods** has been placed in charge of the Industrial Hardfacing Div.

Sanson & Rowland, Inc.—**Raymond C. Franklin** was recently named manager of the Detroit, Mich., sales office.

Norton Co. — **Stanley C. Johnson** has been appointed chief abrasive inspector, succeeding **Harry O. Anderson**, retired.

Taylor Fibre Co.—**John M. Taylor** has been elected chairman of the board, **Merritt H. Taylor**, president, **Clifton N. Jacobs**, vice president in charge of research and engineering, and **John M. Taylor, Jr.**, vice president and secretary.

CEC Instruments, Inc.—**Philip S. Fogg** has been named president, **James B. Christie**, secretary, **Hugh F. Colvin**, treasurer, and **Robert L. Smallman** and **Harold F. Wiley**, vice presidents.

Caterpillar Tractor Co., Plain Sales Div.—**Herman G. Eberling** is now assistant manager.

Joseph T. Ryerson & Son, Inc.—**Paul L. Wright** has been chosen manager of the Buffalo, N. Y., plant.

United Aircraft Corp.—**William R. Robbins** and **Erle Martin** have been elected vice presidents.

Yankee Metal Products Corp.—**Martin E. Karp** has been named chief engineer.

Morrison Steel Products, Inc.—**Clayton A. Stahlka** and **Andrew E. Reiss** have been chosen advertising manager and chief engineer, respectively.

Westinghouse Electric International Co.—**William L. Carroll** was recently elected treasurer and a director.

Heli-Coil Corp.—**Edward H. Rice, Jr.**, has been appointed manager of customer relations.

Republic Aviation Corp., Contracts Div.—**Austin B. Speed** has been named director.

Chrysler Corp.—**David F. Toot** has been made assistant chief engineer in chassis design.

ASK

BAIRD

ABOUT IT!

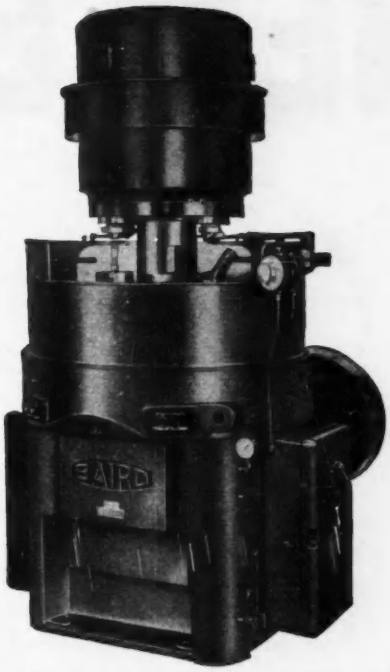
HIGH PRODUCTION TOOLING

GOOD WAY TO BREAK A PARTS BOTTLE NECK . . .

Just the type of machine smart production men are looking for *NOW*

because:

1. It's very **compact.**
2. It's very **easy** to tool and operate.
3. It's very **simple** and dependable.
4. It's extremely **accurate.**
5. It's unusually **versatile.**
6. It regularly turns in **outstanding** production records.



BAIRD NO. 54VC 4 SPINDLE VERTICAL LATHE

The versatility of the Baird No. 54VC (automatic vertical continuous lathe) makes it a most valuable machine for wet or dry cutting of light jobs such as boring piston ends, facing, chamfering, turning bands, etc. It has 4 spindles with 5" chucks mounted in the turret which revolves continuously, eliminating non-productive indexing time. The grip of holding fixtures automatically release for operator to load and unload. Tools feed in and out of the cutting stroke.

Tools move horizontally for facing operations while other tools operate vertically for turning. Worm and gears drive the turret . . . spindles, mounted in roller bearing are driven by helical gears. Fool-proof controls prevent feed of tools to work unless spindles are revolving. Splash guard (as pictured) is used for wet operation. Speed changes are simple, inexpensive.

Baird engineers will provide tooling recommendations and case histories of accurate, fast, profitable production. Bulletin and specifications on request.

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC UNIT & PISTON RING REPAIR MACHINES • AUTOMATIC PRESSES • TOOLING & PARTS

THE *New*

NEW BRITAIN

Copying Lathe

Chips have been a major problem on conventional lathes for a hundred years. With the advent of carbide tools, the chip problem has been even more serious. In designing the new New Britain +GF+ we have, in effect, turned the lathe on its side. The conventional bed has been eliminated, and the copying saddle in which the cutting tool is mounted, is below the spindle. The flow of chips from the fast-cutting carbide tool, falls entirely free, and the chip pile accumulates through the back of the machine for convenient removal.

The New Britain +GF+ copying lathe operator handles the controls, loads and unloads using the power operated tail stock, sets up and adjusts template or prototype, *all from the front of the machine.*

For the new developments in metal turning efficiency, consult your New Britain Sales Engineer first. You'll find it literally true that New Britains are *machines for making progress.*

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES

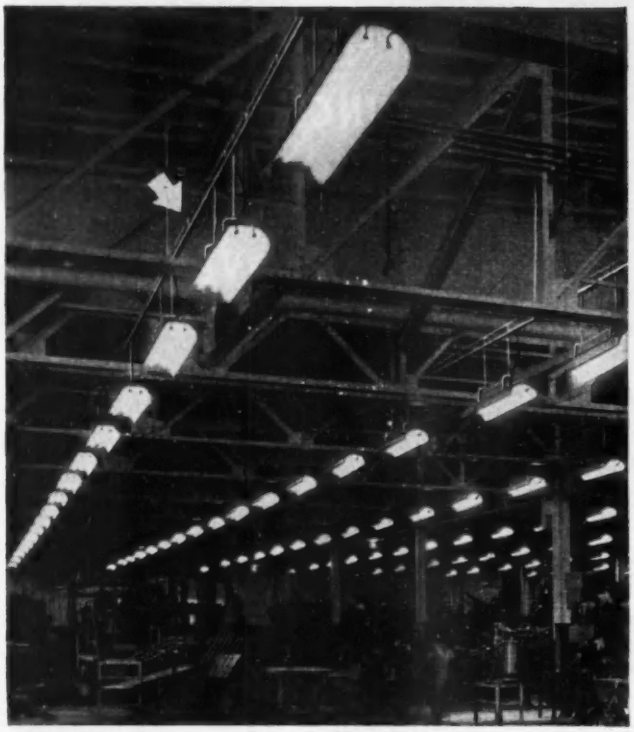
+GF+

A COMPLETELY NEW PRINCIPLE PRODUCES A MAJOR IMPROVEMENT IN LATHE DESIGN.

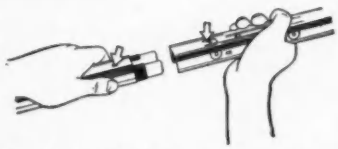
The New Britain **+GF+** copying lathe, created by George Fischer Limited, Schaffhausen, Switzerland. Adapted to American power input requirements and *manufactured in the United States* by New Britain Machine. New to America, the New Britain **+GF+** is the result of fourteen years' development. Hundreds are in successful use the world over.

NEW BRITAIN
Automatics
THE NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

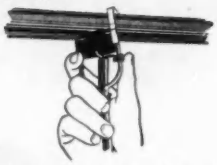
Lighting where and when you need it ... without rewiring!



Safe. Sturdy. Current-carrying Trol-E-Duct bus bars are totally enclosed. Duct itself (arrow) supports fixtures. Continuous slot in bottom of duct means you can move lights (or small portable tools on trolleys) anywhere, any time without rewiring. *It's every inch an outlet!*



Quickly installed. Sections go up in a hurry, join without bolting. Sections are prefabricated, standardized in lengths of 5 or 10 feet. Entire duct can be dismantled and reinstalled easily without a scrapped part.



Convenient. Lighting twist-out plugs slip into duct without cutting off power or upsetting production schedules. Plugs ground on steel casing before contacts touch bus bars, slide in with simple twist anywhere along duct.

Mobile Trolleys. Smooth-rolling trolleys are available to carry small, portable power tools, speed up production. Trolleys ride inside duct on metal wheels. Constant spring pressure against bus bars assures perfect contact.

BullDog Universal Trol-E-Duct lets you add, remove or rearrange lights quickly. No loss of man-hours, money, material.

When it comes to moving lighting fixtures, costs usually skyrocket. Not so with BullDog Universal Trol-E-Duct.

For here is a *truly mobile, fully flexible* lighting system at its money-saving best.

Every inch of Trol-E-Duct is a potential tap-off for lights or small power tools. To move lights or add new ones when you change machine layout, just slip twist-out plugs or trolleys in or out of continuous slot in bottom of duct. Duct itself supports lighting fixtures.

That's all. No rewiring needed. No production lost through shutdowns. No wasted man-hours or scrapped material, either, as with fixed outlet systems.

Trol-E-Duct is prefabricated, standardized and salvable. Installs in a hurry. Can be dismantled and reinstalled without loss.

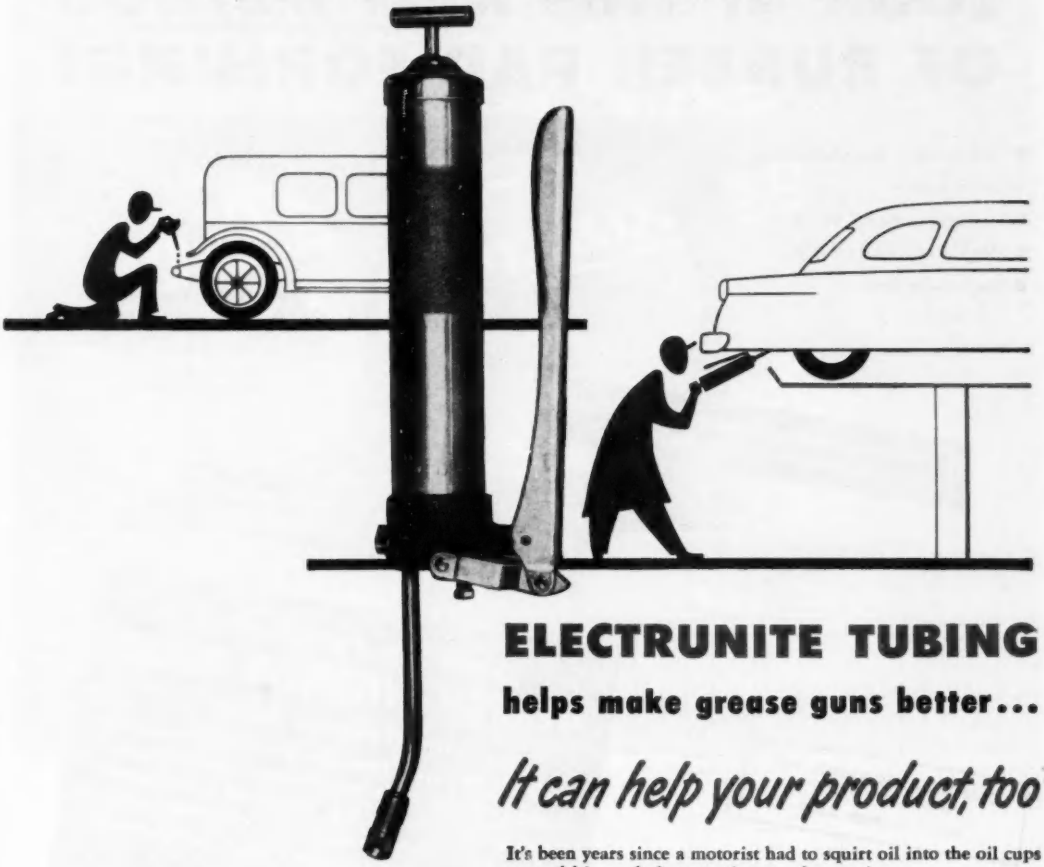
Get all the facts on this modern, low-cost lighting system that fits present needs . . . provides for future needs, as well. Contact a nearby BullDog Field Engineer. He'll show you an installation in your area that will speak for itself. Or, for descriptive bulletin, write BullDog direct, won't you?

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO
PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

BULLDOG

SERVING INDUSTRY FOR 50 YEARS WITH FINER ELECTRICAL PRODUCTS

another case where welded steel tubing does the job best . . .



ELECTRUNITE TUBING

helps make grease guns better . . .

It can help your product, too

It's been years since a motorist had to squirt oil into the oil cups around his car before starting out for a spin.

Today every service station has a variety of powerful pressure grease guns that provide a longer-lasting, squeak-free lube job.

Most likely those guns are made from Republic ELECTRUNITE Welded Steel Tubing . . . light in weight . . . strong to stand rough service. Uniformity of dimension reduces costly machining, smoothness of ID reduces piston wear, helps hold high pressures. Uniformly good OD surfaces take and hold plated finishes, reduce rejection of plated parts after costly finishing has been done.

Service station operators prefer the long, trouble-free service that they get from gun barrels made of ELECTRUNITE Steel Tubing.

We like to tell manufacturers of all types of equipment how ELECTRUNITE Steel Tubing can help them make better products that cost less. May we tell you?

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st STREET • CLEVELAND 8, OHIO

Made by the producers of **ELECTRUNITE** The *"Original"* ELECTRIC-WELDED BOILER TUBE

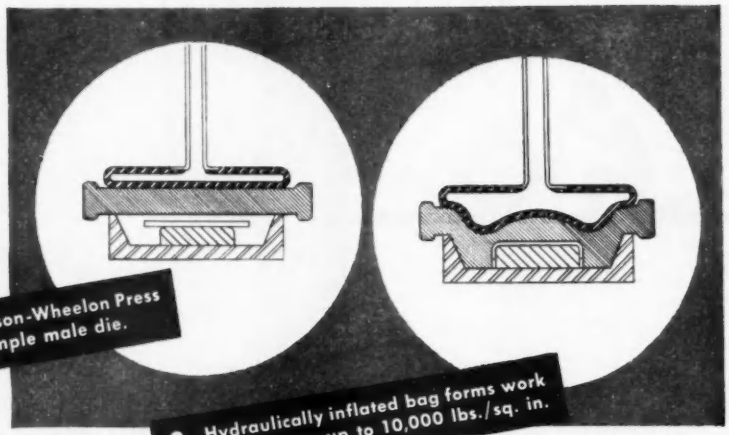
1902 50th ANNIVERSARY 1952 STEEL AND TUBES DIVISION ELECTRUNITE TUBING

Republic REPUBLIC STEEL

ELECTRUNITE TUBING

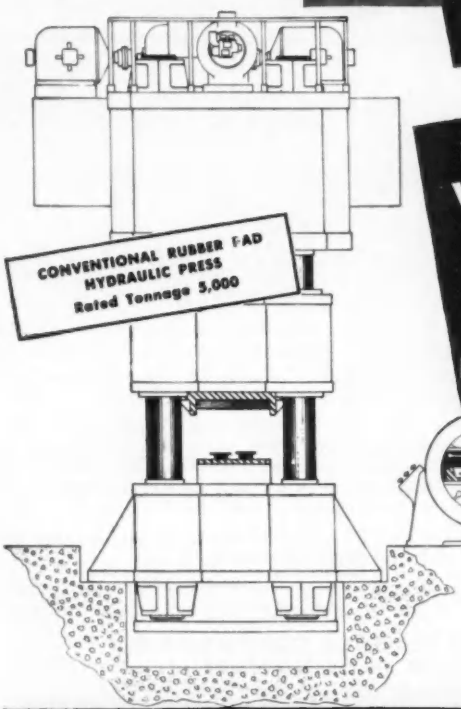
LOOK AT THIS *NEW METHOD* OF RUBBER PAD FORMING!

- Completely Revolutionary
- Costs Less
- Eliminates Hand Work
- Simple Male Die Only
- No Set-up Time



1. Blank inserted in Verson-Wheelon Press over inexpensive, simple male die.

2. Hydraulically inflated bag forms work at pressures up to 10,000 lbs./sq. in.

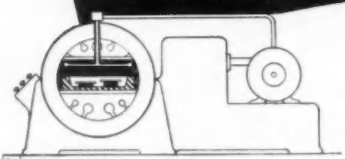


CONVENTIONAL RUBBER PAD HYDRAULIC PRESS
Rated Tonnage 5,000

DONE BY THIS LITTLE VERSON-WHEELON PRESS

Rated Tonnage 10,800

With this little press, heavy gauge metal is completely formed—it will even make perfect return flanges! Compare it with the big, expensive conventional rubber pad forming press at the left which seldom turns out pieces not requiring further hand forming.



GET THIS BULLETIN!

. . . Complete information of the Verson-Wheelon Press and the revolutionary new rubber pad forming process. Ask for Bulletin VW-52.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9307 South Kenwood Avenue, Chicago 19, Illinois — So. Lamar at Ledbetter Dr., Dallas Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING

GITS Unit* SEAL
Now STANDARDIZED

For . . .

Gear Reduction Units
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If *you* have a shaft sealing problem, Gits experience in these and many other specific applications can prove of great and immediate value to you.

Write today for FREE illustrated Brochure, or send us your seal problem.

*Cartridge Seal . . . pressure balanced . . . requiring only 25% more space than lip-type seals.

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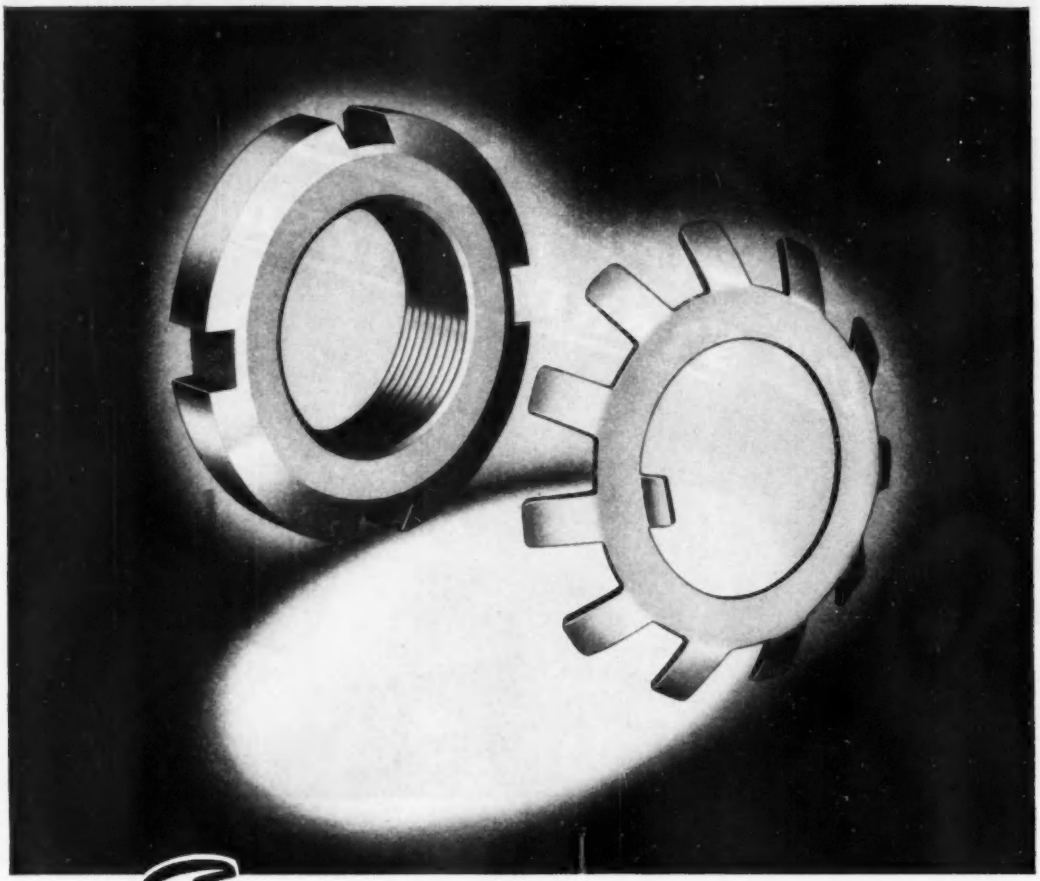
Gits Lubricating Devices,
The Standard For Industry For Over 40 Years



Standard

Locknuts and Lockwashers are your assurance of rugged strength but smooth bearing assembly action. Precise, solid locking permits accurate shaft adjustment and gives you long-life performance. The skilled craftsmanship that produces Standard Locknuts and Lockwashers is available for the manufacture of special locknut and lockwasher items for any application. Your requests for quotations receive prompt attention and all orders receive Standard's prompt shipping service. *Order today*—SPECIFY STANDARD!

Write for STANDARD'S detailed Bulletin No. 29 today!

STANDARD **Locknut and Lockwasher, Inc.**
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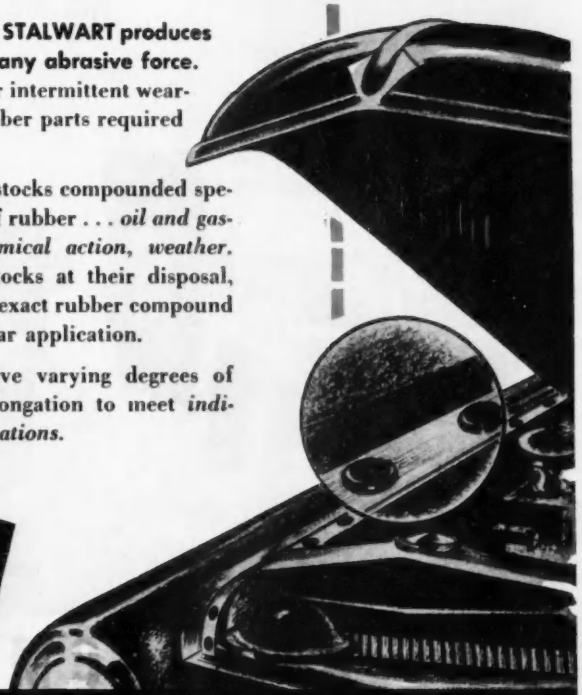
WHEN ABRASION IS THE PROBLEM...

...SPECIFY STALWART RUBBER PARTS

From dog bones to hood grommets, STALWART produces rubber parts to withstand almost any abrasive force. Maximum resistance to continual or intermittent wearing action can be built into the rubber parts required for *your product.*

STALWART can supply parts from stocks compounded specifically to combat other enemies of rubber . . . *oil and gasoline, extreme temperatures, chemical action, weather.* From more than *500* different stocks at their disposal, **STALWART** experts can specify the exact rubber compound which will serve best in a particular application.

Precision-fabricated parts can have varying degrees of hardness, tensile strength, and elongation to meet *individual, S.A.E. or A.S.T.M. specifications.*



Write today for illustrated catalog No. 51SR-1 for additional details.

610-SR

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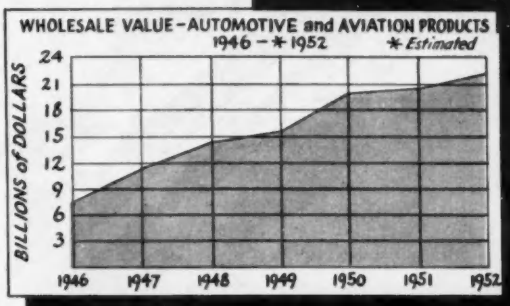
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

The trend is UP

A progress report on automotive and aviation manufacturing and its basic medium . . . AUTOMOTIVE INDUSTRIES

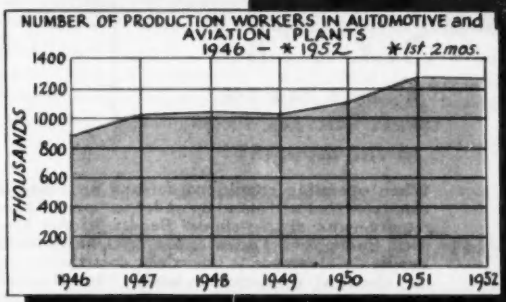
Now . . . a $21.3 billion industrial field

In seven busy years, the total wholesale value of the products made by the automotive and aviation industries has tripled! This nation-wide industrial field produces cars, trucks, buses, tractors, aircraft; their engines, parts, accessories, materials and production equipment . . . plus planes, tanks, tactical vehicles and other vital defense tools.



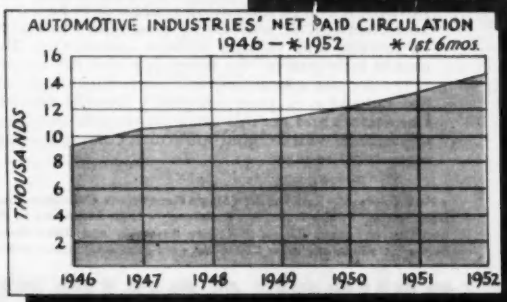
Production worker total increases 43%

Since 1946, the number of production workers in companies manufacturing vehicles, parts, aircraft, aircraft parts, tractors and engines has grown 43%, reflecting the expanding activity in the automotive and aviation industries. This vast industrial market in 1952, will buy over $11 billion worth of parts, materials, supplies and production equipment . . . and its purchasing power is increasing steadily.



Circulation up 55% and still growing

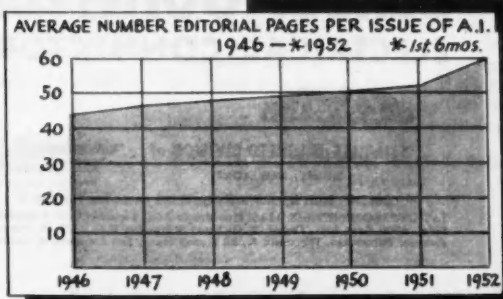
AUTOMOTIVE INDUSTRIES is subscribed to by over 14,500 design, engineering, production, administrative and purchasing executives. Coupled with this healthy growth is its strict quality control, assuring executive-level readership. AUTOMOTIVE INDUSTRIES' quality coverage places your sales message before the buying teams of 3,124 automotive and aviation plants.



36% greater editorial coverage

Both in number of editorial pages and in new features, AUTOMOTIVE INDUSTRIES has expanded greatly its editorial service to automotive and aviation manufacturing executives. Clearly and completely, it reports all the latest news in automotive and aviation design, production, and engineering, keeping pace with the numerous developments in this multi-billion dollar market.

Now, advertisers obtain a new high in selling impact . . . in depth of penetration of America's No. 1 industrial market with AUTOMOTIVE INDUSTRIES, the news magazine of automotive and aviation manufacturing.



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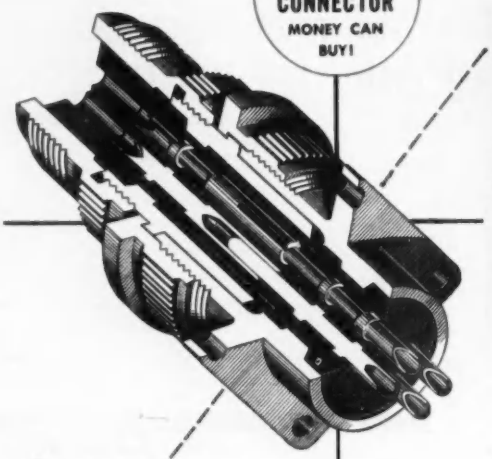
The Finest
ELECTRICAL
CONNECTOR
MONEY CAN
BUY!



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ASSURES YOU THE
LOWEST VOLTAGE DROP
IN THE INDUSTRY!

When operating conditions demand an electrical connector that will stand up under the most rugged requirements, always choose Bendix Scinflex Electrical Connectors. The insert material, an exclusive Bendix development, is one of our contributions to the electrical connector industry. The dielectric strength remains well above requirements within the temperature range of −67°F to +275°F. It makes possible a design increasing resistance to flashover and creepage. It withstands maximum conditions of current and voltage without breakdown. But that is only part of the story. It's also the reason why they are vibration-proof and moisture-proof. So, naturally, it pays to specify Bendix Scinflex Connectors and get this extra protection. Our sales department will be glad to furnish complete information on request.

• Moisture-Proof • Radio Quiet • Single Piece Inserts • Vibration-Proof • Light Weight • High Insulation Resistance • High Resistance to Fuels and Oils • Fungus Resistant • Easy Assembly and Disassembly • Fewer Parts than any other Connector • No additional solder required.

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ELECTRICAL CONNECTORS

Bendix

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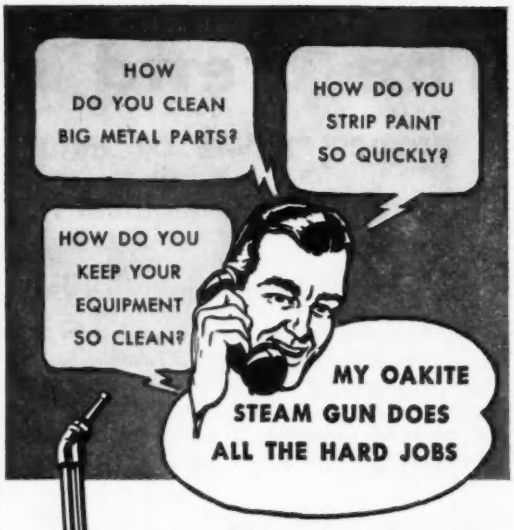
HOW DO YOU CLEAN BIG METAL PARTS?
HOW DO YOU STRIP PAINT SO QUICKLY?
HOW DO YOU KEEP YOUR EQUIPMENT SO CLEAN?
MY OAKITE STEAM GUN DOES ALL THE HARD JOBS

Yes, his Oakite Steam Gun does practically every cleaning job that's too big or too difficult for ordinary methods.

It cleans metal parts that are too large for tanks or washing machines . . . It strips paint from large surfaces . . . It cleans large equipment such as:

- die casting machines
- wire drawing machines
- blooming mill rollers
- brass reduction machines
- millers and grinders
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- stamping machines

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SPECIALIZED INDUSTRIAL CLEANING
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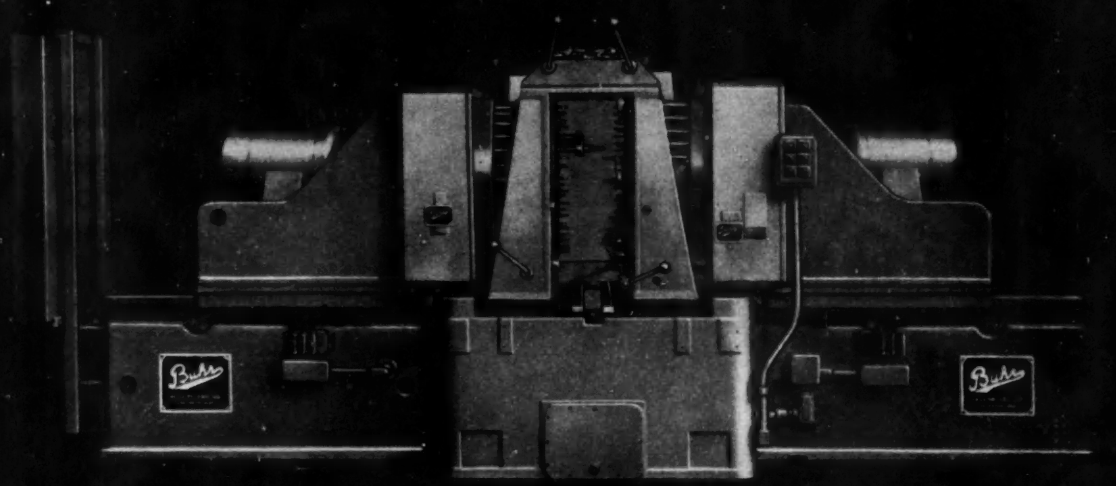
MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

HERE IS WHAT STALIN HATES!



It's not tanks, planes, guns, ships, atomic bombs and armed forces that Joe Stalin hates . . . It's the productive power behind them—productive power that is symbolized by this Buhr Two-Way Hydraulic-Feed Drilling Machine which is now hard at work day-in and day-out . . . helping one of the world's largest manufacturers turn out automatic transmission cases for tanks . . . This kind of Machine —more than anything else—is what Stalin hates.

Industries Turn to Machinery Like This . . . which Performs 93 Operations at Once

To help stymie Stalin, one of the world's largest engine makers was awarded an enormous defense order. Production had to get under way as quickly as possible!

One of Their Problems

To drill, ream and chamfer this automatic transmission case—that was one of the problems.

To handle this very important phase of their production, they turned to Buhr.

What the Machine Does

In general—it drills, counterdrills and countersinks 41 holes in front end of transmission case . . . and drills, counterdrills and countersinks 52 holes in rear end of case.

Specifically, the Machine accomplishes this—

From the left:

Drills (1) 25/32" diameter hole through
Drills and counterdrills (28) #1 holes
Drills and counterdrills (8) #2 holes
Drills (1) 29/32" diameter hole through
Drills (1) 7/8" diameter hole 3/4" deep
Drills and countersinks (2) end cover dowels on vertical center.

From the right:

Drills and counterdrills (11) #1 holes
Drills and counterdrills (8) #2 holes
Drills (12) #3 holes through
Drills and counterdrills (12) #10 holes
Drills and counterdrills (1) #19 hole
Drills and counterdrills (8) #6 holes

Production: 40 pieces per hour at 100% efficiency.

Why They Turned to Buhr

Buhr is an old and trusted friend by many of the leading U.S. Industries. Many have turned to Buhr for the past quarter-century. Their manufacturing facilities are excellent. In sales, engineering and production, Buhr has trustworthy and experienced staffs—staffs that are specialized in this field and able to service every part of the Country.

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This 48-Page Catalog . . . as well as one of our Sales Engineers . . . are at your beck and call. For every problem involving this type of Special Machinery—including defense production to halt Stalin—phone, wire, or write us.

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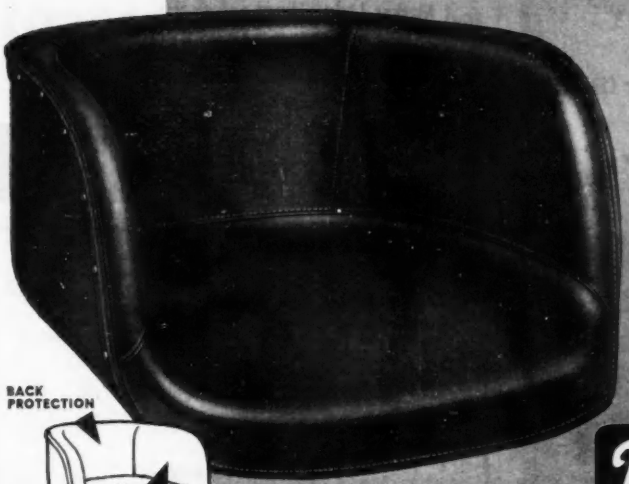

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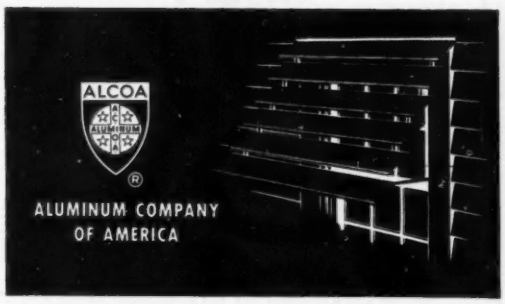

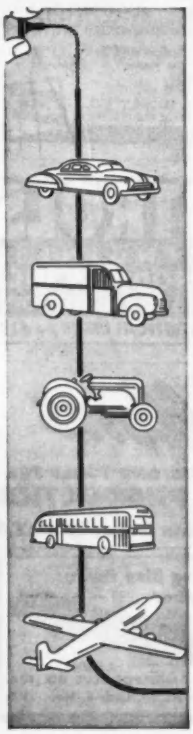

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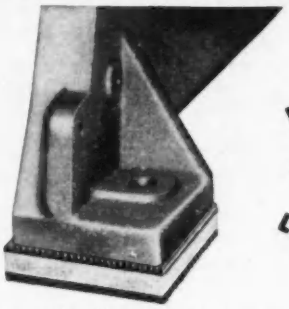

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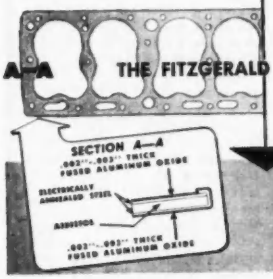

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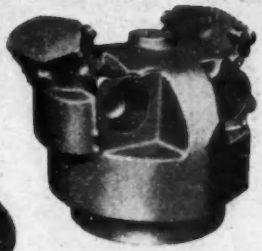
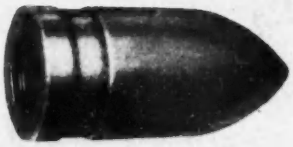
Truck Brake Spider



Aircraft Cylinder Head

Diesel Generator Quill



Shell Nose

Shell Body (Half Section)

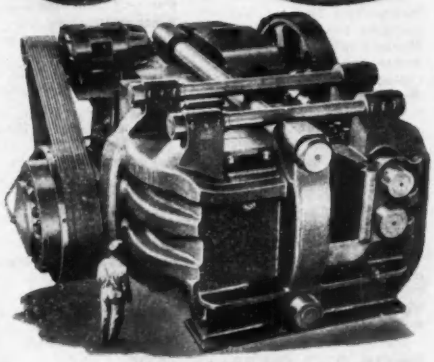
Aircraft Cylinder Barrel

Diesel Cylinder Liner

Aircraft Propeller Shaft

In World War II, the art of deep-piercing in Forging Machines came into its own. Forgings previously thought "impossible" were made routine by the pressing demands of war.

NATIONAL'S engineers and machines were "in the thick" of this forging development. Forgemen *still* choose NATIONAL Forging Machines for their difficult work . . . and *still* rely upon NATIONAL for assistance with their problems.



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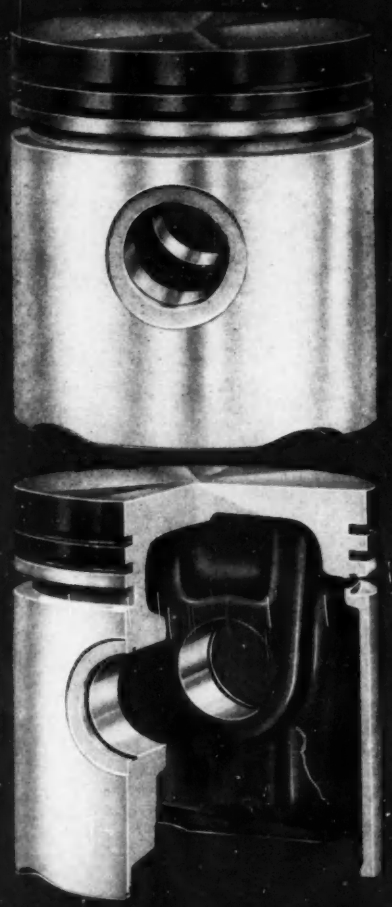

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IN COOPERATION WITH ENGINE BUILDERS

HIGHWAY

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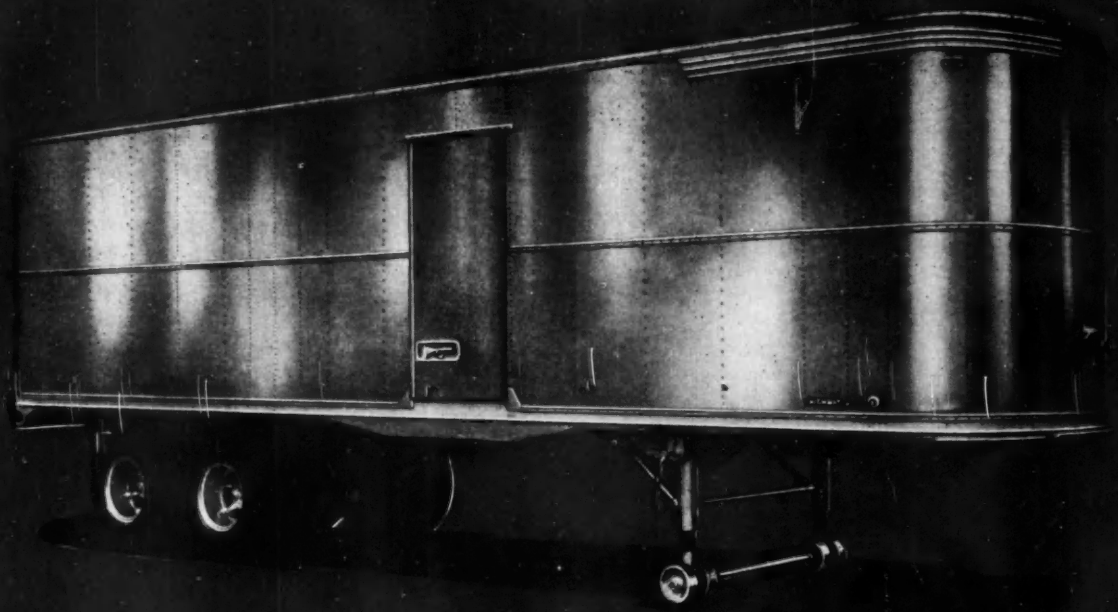

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